# 1994 303 (d) LIST OF WATERS FOR KENTUCKY

Natural Resources and
Environmental Protection Cabinet
Division of Water

October 1995

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Kentucky Department for Environmental Protection
Division of Water

for Jack A. Wilson, Director

Oct. 11, 1995
Date

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## INTRODUCTION

Pursuant to Section 303(d) of the Clean Water Act, the State of Kentucky has developed a list of waterbodies presently not supporting designated uses. As required by 40 CFR 130.7(b)(4), these waters have been prioritized for total maximum daily load (TMDL) development. The purpose of this report is not only to list and prioritize impacted waters, but to describe efforts that have been and continue to be made to address problems in waters listed in previous 303(d) reports.

## ONGOING PROJECTS

The Kentucky Division of Water (KDOW) has several watershed projects in progress to address problems found in previous assessments and prioritized in 303(d) reports (KDOW 1990, 1992a) (Table 1). Several TMDL projects (Floyds Fork, Harrods Creek, East Fork Little Sandy River, Mayfield Creek, North Fork Kentucky River, Taylorsville Lake) were recently submitted to EPA for approval (Appendix A). EPA subsequently approved the North Fork Kentucky River, East Fork Little Sandy River, and the Harrods Creek TMDL projects (Appendix A). Decisions on the other TMDL projects submitted to EPA should be forthcoming and will be included in the final report.

The Upper Salt River/ Taylorsville Lake TMDL project began in 1991 with the goals of addressing eutrophication problems in the lake and reducing nutrient and bacteria levels in the Salt River and its tributaries. The KDOW began an intensive sampling program throughout the watershed in 1991 to determine the sources of nutrient input. A report was recently released (KDOW 1994a) that summarized the phosphorus data. High phosphorus concentrations in the Salt River were attributed primarily to nonpoint source runoff from the fertile soils of the Inner Bluegrass physiographic region. The U.S. Army Corps of Engineers (COE) is presently modelling the response of the water quality of Taylorsville Lake to various watershed management techniques by means of the CE-QUAL-W2 model and available water quality data. Modelling results will be used to identify best management practices (BMPs) in the watershed that will most effectively reduce nutrients from nonpoint sources. Over one million dollars have already been spent to implement BMPs to treat wastewater from concentrated animal management areas on dairy farms. These BMPs not only have reduced known bacteria contamination problems, they also were a first step in reducing nutrient input to streams in the watershed. Post-BMP monitoring of streams in the watershed and Taylorsville Lake will determine the effectiveness of the program.

The North Fork Kentucky River was identified as high priority in the 1992 303(d) report (KDOW 1992a) because of a swimming advisory on its entire 163-mile length. As a result of repeated compliance sampling inspections, fines totalling $31,000 were issued to all permitted dischargers that failed to meet KPDES permit limits for fecal coliform bacteria. Because of the KDOW's compliance and enforcement efforts and capital improvements to the three largest municipal wastewater treatment plants, water quality improved and in 1993 the swimming advisory was removed on approximately 76 miles of the lower river. Further, the Hazard publicly owned treatment works (POTW) is scheduled to begin building a new facility later this year, and the Perry County Sanitation District will begin repairs on broken sewer lines and bypassing lift stations. However, numerous straight pipes discharging raw domestic sewage were found in the upper portion of the drainage. These illegal discharges are preventing the North Fork from attaining the swimming use. This TMDL project was recently approved by EPA Region IV (Appendix A). The maximum load (or concentration in this case) for fecal coliform bacteria is the same as the water quality criteria because the KDOW does not allow instream dilution for indicator bacteria. Educational, technical, and some financial assistance will be made available to a community in the North Fork basin as a demonstration project to gradually eliminate the straight pipe discharges and other nonpoint sources of fecal coliform bacteria contamination. The KDOW's Nonpoint Source Section has obtained Section 319(h) Nonpoint Source Implementation Grant money and is working with the Department for Health Services, Kentucky River Regional Health District, the Division of Plumbing, and local officials and citizens to reduce the occurrences of straight-pipe discharges. This will be accomplished by demonstrating and implementing selected low-cost best management practices for onsite wastewater disposal through a program of education, technical assistance, financial assistance, tiered enforcement, and monitoring. Education is an essential element of the program. Attitudes and behaviors that contribute to water quality degradation must be changed, and project visibility and the perceived need for BMPs must be heightened. Activities include news releases, radio announcements, educational programs in primary and secondary schools, public meetings, development and dissemination of publications, and door-to-door contacts. However, because of the widespread nature of the problem and the rugged topography of eastern Kentucky, the elimination of straight-pipe discharges will be difficult to achieve.

Herrington Lake was identified in the 1992 305(b) report (KDOW 1992b) as not meeting aquatic life use because of low dissolved oxygen levels and repeated fish kills. The lake was given a medium priority in the 1992 303(d) report. The KDOW has collected water quality data from the Dix River just upstream of the lake since 1985. Additional baseline nutrient data collection has begun at a site on Clarks Run downstream of the City of Danville's POTW outfall, at the Danville POTW, and at two other municipalities further upstream of the lake. Recently, Section 104(b)(3) grant monies were obtained from EPA to perform an in-depth study of the sources of nutrients causing water quality problems and to determine the nutrient assimilation capacity of Herrington Lake. These monies are being passed through the Kentucky Natural Resources and Environmental Protection Cabinet (KNREPC) to the U.S. Geological Survey (USGS). In addition, the USGS will supplement the study with calibration and validation of COE's CE-QUAL-W2 and EPA's WASP physically-based models. The effort will provide an assessment of the lake's nutrient and trophic state dynamics and their link with land use and point source discharges. The work plan prepared by the USGS provided in Appendix B gives further details on this project. The study was initiated in September 1994 and has a scheduled completion date of September 1997. Project progress will be provided in future 303(d) reports.

The East Fork Little Sandy River, Floyds Fork, Harrods Creek, and Mayfield Creek projects were (and are) similar in that they involved wasteload allocation modelling of watersheds receiving multiple discharges, sampling of instream conditions, and issuing appropriate permit limits for new and existing facilities. Several new facilities were denied surface water discharge permits, and regionalization is proceeding in the first three watersheds listed above. The KDOW continues to closely evaluate all permit requests in these watersheds and to work toward reducing existing package plants and the construction of new ones.

## METHODS OF ASSESSING USES FOR 1994 305(b) REPORT

The lists of waters not supporting designated uses were derived from the "1994 Kentucky Report to Congress on Water Quality" (KDOW 1994b) and "Assessment of Water Quality Conditions - Ohio River Main Stem, Water Years 1992 - 1993" (Ohio River Valley Water Sanitation Commission, 1994), hereafter referred to as "305(b) reports." Methods used to assess Kentucky's waters, described in detail in the 305(b) reports, are summarized below.

Monitoring Programs. Information from biological monitoring conducted by the KDOW in 1992-93 at 44 ambient water quality stations, six intensive survey sites, and 40 reference reach sites was the basis of assessing support of aquatic life uses in many instances. Water quality data collected on a regular basis by: 1) the KDOW at 44 stations, 2) the Ohio River Valley Water Sanitation Commission (ORSANCO) at 18 main stem and five tributary stations of the Ohio River, and 3) the U.S. Geological Survey (USGS) at several sites in Jefferson County was another means of assessing water quality and support of aquatic life and recreation uses. Surveys completed by Kentucky Department of Fish and Wildlife Resources District Biologists allowed for the evaluation and assessment of many additional waters in the 1994 report. Intensive bacteriological surveys by the KDOW in the North Fork Kentucky River basin, the lower Licking River basin, the upper Cumberland River basin, and five lakes (the latter with the help of the Big Sandy Area Development District) were also used in assessing the state's waters for recreational uses.

Domestic water supply use was not often assessed because instream water quality data are not available at points of withdrawal where the use applies. A survey of operators of drinking water plants on lakes regarding algal and taste and odor problems allowed some drinking water use assessments to be made for lakes. To better assess drinking water use, future 305(b) reports will use data recently required by the Safe Drinking Water Act from public water systems.

Lakes were assessed primarily by: 1) a KDOW sampling program that periodically determines the trophic state and water quality of all Kentucky's major lakes and many of its smaller lakes by nutrient and chlorophyll *a* sampling during the growing season, 2) similar data supplied by the COE on several major impoundments, and 3) data collected by Murray State University on Kentucky Lake through funding by a Section 314 Clean Lakes Grant.

Use of Data. Water quality data were compared with their corresponding criteria. All of the criteria except fecal coliform were used to assess warmwater aquatic habitat use support. The segment did not support the warmwater aquatic habitat use if the criteria for dissolved oxygen, un-ionized ammonia, temperature, or pH were exceeded in greater than 25 percent of the samples collected during the period of October 1991 - September 1993.

Data for mercury, cadmium, copper, lead, and zinc were analyzed for violations of acute criteria listed in state water quality standards using three years of data (October 1990 - September 1993). At stations where data were collected quarterly or less frequently, the segment was not supporting if one or more observations exceeded criteria. At stations where data were collected monthly, the segment was not supporting if two or more observations exceeded criteria.

In areas where both chemical and biological data were available, the biological data were generally the determinate factor for establishing warmwater aquatic habitat use support status. This is especially true when copper, lead, or zinc data were contradicted by biological data.

Biological assessments were done by means of selected metrics for fish, macroinvertebrates, and diatom communities and habitat and physicochemical characteristics. A waterbody did not support its designated uses if the biological community was severely altered (dominated by pollution-tolerant organisms, had very high or low biomass, or possessed other significant functional alterations) or habitat characteristics were severely impacted.

Fecal coliform bacteria data were used to indicate degree of support for primary contact recreation (or swimming) use. Primary contact recreation was not supported if the fecal coliform criterion was exceeded greater than 25 percent of the time based on two years of monthly data collected during the recreation season (May through October). In addition, streams or lakes with a pH below 6.0 units were listed as not supporting the swimming use.

## RESULTS OF 1994 USE ASSESSMENTS

Of 15,892 stream miles assessed (including the Ohio River), 11,416 miles (72%) fully supported uses, 2883 miles (18%) did not support uses, and 1593 miles (10%) partially supported uses (Table 2). Individual streams not supporting uses are presented in Appendix C. Full support of warmwater aquatic habitat use was attained in 81% (12,710 of 15,600 miles) of waters assessed (Table 3). Full support of the swimming use was attained in only 42% (2178 of 5228 miles) of waters assessed (Table 3). The two most common causes of swimming and warmwater aquatic habitat use nonsupport were fecal coliform bacteria contamination and siltation, respectively (Table 4). Agriculture activities, package plants, and onsite waste disposal systems were major sources of fecal coliform bacteria contamination. Combined sewer overflows (CSOs) remained a significant problem on the Ohio River. Swimming use was not supported on 128 miles of the Ohio River downstream of cities with CSOs. The remaining 536 miles of the Ohio River bordering Kentucky only partially supported the use (see Appendix D). Coal mining and agricultural activities were the primary sources of siltation (Table 5).

Of 103 lakes assessed, uses were fully supported on 67 (193,424 acres), partially supported on 31 (20,510 acres), and not supported on five (3316 acres) (Table 6). Of individual uses, swimming was supported in all but 219 of 217,250 acres assessed, and aquatic life use was supported in 95 percent of the same number of assessed acres (Table 7). Only five lakes did not support uses (Table 8), and another 31 lakes partially supported uses. Nutrients from nonpoint sources caused the majority of use nonsupport in lakes, resulting in low dissolved oxygen levels that affected support of the warmwater aquatic habitat use (Tables 9 and 10). The second leading cause of use nonsupport in lakes was priority pollutants (PCBs) from industrial point sources that affected the fish consumption use in Green River Lake (Tables 9 and 10).

## PROGRAMS TO ADDRESS WATER QUALITY ISSUES

Kentucky has several programs in place that address the problems noted above. Two of the most important programs are in the areas of nonpoint source pollution prevention and remediation and wastewater treatment regionalization. Many of the fecal coliform and nutrient problems that cause use nonsupport are addressed by these programs. Both programs have been described in previous reports, but they are also included in this report to provide a biennial update.

Regionalization efforts in recent years have gradually reduced the number of package plants that treat domestic wastewaters. Each year from 1989 through 1993, an average of about 100 package plants have been inactivated (KDOW 1994c). In that same time, the number of new KPDES permits issued by the KDOW for package plants has declined. The 1992 303(d) report described successful regionalization efforts in several cities and counties in the state. Several of these projects have continued through the current reporting period, and more package plants were eliminated (Figure 1). There were no new major regionalization projects for this reporting period. Several sewer systems, including Metropolitan Sewer District (MSD) in Jefferson County and Campbell-Kenton County Sanitation District #1 in northern Kentucky, continued to gradually eliminate package plants in areas into which service was extended. Several projects in the construction and planning phase will significantly reduce (approximately 170) package plants in the near future in Bath, Boone, Boyd, Daviess, Franklin, Jefferson, McCreary, Perry, and Oldham counties. Progress on these projects will be detailed in the 1996 303(d) report.

Kentucky has 25 combined sewer systems with a total of 354 overflow points. About one-third of the CSO points are in the Louisville-Jefferson County area. Approximately 90 percent of the CSOs discharge to the Ohio River mainstem or immediate tributaries. Discharge permits containing CSO language have been issued to all but four of the combined sewer systems; the remaining systems will have permit language in place by mid-1996. The permit language requires compliance with the nine minimum controls of a sewer operational plan. These minimum controls are:

1) proper operation and regular maintenance programs
2) maximum use of collection system for storage
3) review and modification of pretreatment requirements
4) maximum flow routing to treatment plant
5) elimination of dry weather CSOs
6) control of solid and floatable materials
7) pollution prevention
8) public notification of CSO occurrences and impacts
9) monitoring to characterize CSOs and effect of control measures

Cities are at various stages of development or implementation of the plan. Efforts to date have been to locate and identify CSO points and collect data indicating amount, duration, and frequency of each CSO and to collect rainfall data. Some data on CSO and stream water quality characteristics have been collected and submitted to the KDOW. Grant monies passed through the KNREPC were used by the University of Kentucky and MSD to assess water quality impacts of CSOs in northern Kentucky and Louisville/Jefferson

County, respectively. These assessments will help to prioritize efforts to eliminate CSO discharges. As the combined sewer systems are defined, progress in the elimination of CSOs in several areas should be expected in the next 303(d) reporting period.

Section 319(h) Nonpoint Source Implementation Grant monies have also been awarded to several entities throughout the state to address nonpoint source issues. From 1990 through 1994, annual grants have been obtained from EPA that total over 5.6 million dollars (over nine million dollars when grant matches are included). Projects are currently underway that range from an evaluation of karst feature vulnerability, to urban runoff education programs, to assessing runoff from abandoned mine lands. Four (Floyds Fork, Harrods Creek, North Fork Kentucky River, and Salt River/ Taylorsville Lake) former or current TMDL projects have Section 319(h) Nonpoint Source Implementation Grant monies directed to nonpoint source remediation activities in their watersheds (see Appendix E). The nonpoint source program is described in detail in the Nonpoint Source Management Program document (KDOW 1989), a document that is currently being updated.

Another nonpoint source initiative was established by the 1994 Kentucky legislature. The Agricultural Water Quality Authority will develop BMP manuals for agricultural and silviculture practices and direct cost-share monies to nonpoint sources identified as causing water quality problems. The implications of this legislation are as yet not fully known, but the next 303(d) report will indicate progress that results from the authority's activities.

## PRIORITIZATION OF WATERS NOT MEETING USES

The Kentucky Water Interagency Coordinating Committee (KWICC) was formed in 1991 to convene representatives of nonpoint source pollution control interests on a regular basis to discuss water quality issues. The charge of the group is to share information, review and facilitate Section 319(h) Nonpoint Source Implementation Grant projects and project proposals, coordinate activities and data, and promote accomplishments. In November 1994, the committee met to discuss the 303(d) listing and prioritization of waters impacted by nonpoint sources. Representatives of the following agencies were involved:

University of Kentucky (UK) Dept. of Agricultural Engineering
UK Dept. of Agronomy
UK Cooperative Extension Service
KY Dept. of Agriculture, Division of Pesticides
U.S. Dept. of Agriculture, Natural Resources Conservation Service
U.S. Dept. of Agriculture, Farm Service Agency
Kentucky Farm Bureau

Kentucky Geological Survey
Kentucky Division of Conservation
Kentucky Division of Water

The committee produced candidate lists containing 59 medium priority waters and 132 low priority waters impacted by agricultural nonpoint source pollution. Medium priority waters were those that either were not supporting any two uses or were not supporting the drinking water use. Low priority waters were those that did not support either the warmwater aquatic habitat or swimming use. In the opinion of the members of KWICC, no nonpoint source-impacted waters should be identified as high priority because most BMP funds are being targeted to existing watershed projects.

Waters prioritized for TMDL development are shown in Table 11. Streams chosen as high priority are affected primarily by point sources, and the KDOW will focus efforts in this area. Nonpoint source contamination will be addressed according to available resources.

The streams in the upper Cumberland River basin have been selected as high priority waters because of the widespread fecal coliform bacteria contamination found in 1993 and 1994 surveys that resulted in swimming advisories issued in 1994. Streams included as high priority are two reaches (13 miles) of the Cumberland River, 25 miles of Poor Fork below Harlan, and three miles of Looney Creek. (Mileages are different from those in the 1994 305(b) report because of additional bacteria surveys in 1994.) Similar to the North Fork Kentucky River project, the primary means of attaining the swimming use will be to aggressively pursue compliance and enforcement measures, upgrade several municipal facilities (Evarts, Loyall, Lynch, Harlan, Benhan, Cumberland, Pineville), eliminate outdated and overloaded package plants (by connecting to regional plants wherever possible), and work to eliminate straight pipe discharges.

Chenoweth Run, a tributary of Floyds Fork in the Salt River basin in east-central Jefferson County, has been selected as a TMDL project. The 1994 305(b) report listed nine miles of Chenoweth Run as not meeting either aquatic life or swimming uses because of organic enrichment, nutrients, metals, and pathogens stemming from urban runoff and domestic (both municipal and package plants) wastewaters. Other areas of the Floyds Fork watershed have already been prioritized by the KDOW. Interest in the Chenoweth Run watershed from both developmental and environmental concerns warrants resources now being focused in this particular area as well.

Most other waters rated as medium priority by the KWICC (except those with ongoing TMDL projects) remained as medium priority. Waters not supporting uses not listed on Table 10 and waters partially supporting uses are considered by the KDOW to have low priority.

## REFERENCES

Kentucky Division of Water. 1989. Kentucky Nonpoint Source Management Program.

______. 1990. Section 303(d) List of Waterbodies for Kentucky.

______. 1992a. Final 303(d) List for Kentucky.

______. 1992b. 1992 Kentucky Water Quality Report to Congress on Water Quality.

______. 1994a. Sources and Loadings of Total Phosphorus into Taylorsville Lake.

______. 1994b. 1994 Kentucky Report to Congress on Water Quality.

______. 1994c. Regionalization of Wastewater Treatment Facilities in Kentucky: Progress, Problems, and Recommendations.

Ohio River Valley Water Sanitation Commission. 1994. Assessment of Water Quality Conditions, Ohio River, 1992-93.

**Table 1**
**Waterbodies from 1990 and 1992 303(d) Lists Prioritized as Candidates for TMDL Development**

| Waterbody Name | Waterbody Number | Miles (Acres) |
|---|---|---|
| **HIGH PRIORITY** | | |
| North Fork Kentucky River | 5100201-002 | 55.1 |
| | 5100201-005 | |
| | 5100201-008 | |
| Taylorsville Lake | 5140102-025L01 | (3050) |
| **MEDIUM PRIORITY** | | |
| Newcombe Creek | 5090104-009 | 11.9 |
| Lick Creek | 5100101-037 | 9.2 |
| Raccoon Creek | 5100101-037 | 5.2 |
| Burning Fork | 5100101-038 | 7.5 |
| State Road Fork | 5100101-038 | 5.1 |
| Rockhouse Fork | 5100101-038 | 5.0 |
| Billey Fork | 5100204-009 | 8.1 |
| Millers Creek | 5100204-009 | 6.4 |
| Big Sinking Creek | 5100204-009 | 14.1 |
| South Fork Red River | 5100204-018 | 10.1 |
| Sand Lick Creek | 5100204-018 | 5.0 |
| East Fork Little Sandy River | 5100204-018 | 6.0 |
| Clarks Run | 5100205-039 | 8.0 |
| Floyds Fork | 5140102-007 | 61.6 |
| | 5140102-011 | |
| | 5140102-014 | |
| Harrods Creek | 5140101-004 | 31.9 |
| Herrington Lake | 5100205-038L01 | (2940) |
| Blaine Creek-Mainstem | 5070204-006 | 11.5 |
| Newcombe Creek | 5090104-009 | 6.9 |
| Licking River-Mainstem | 5100101-034 | 6.4 |
| Lick Creek | 5100101-037 | 9.2 |
| Raccoon Creek | 5100101-037 | 5.2 |
| Burning Fork | 5100101-038 | 7.5 |
| State Road Fork | 5100101-038 | 5.1 |
| Big Sinking Creek | 5100204-009 | 14.1 |
| Billey Fork | 5100204-009 | 8.1 |
| Millers Creek | 5100204-009 | 6.4 |
| Sand Lick Fork | 5100204-018 | 5.0 |
| South Fork Red River | 5100204-018 | 10.1 |
| Roaring Paunch Creek | 5130104-008 | 15.6 |
| Harrod's Creek | 5140101-004 | 4.0 |
| Floyds Fork | 5140102-007 | 24.2 |
| Floyds Fork | 5140102-011 | 23.6 |
| Salt River | 5140102-029 | 10.5 |
| Salt River | 5140102-031 | 40.0 |
| Salt River | 5140102-033 | 20.2 |
| Taylorsville Lake | 5140102-025 | (3050) |

**Table 2**
**Summary of Assessed Use Support (miles)**

| Degree of Use Support | Assessment Basis: Evaluated | Monitored | Total Assessed |
|---|---|---|---|
| Miles Fully Supporting | 8033.2 | 3234.4 | 11,416 |
| Miles Partially Supporting | 325.1 | 731.6 | 1,593 |
| Miles Not Supporting | 991.8 | 1763.9 | 2,883 |
| TOTAL | 9350.1 | 5877.8 | 15,892 |

**Table 3**
**Summary of Individual Use Support for Rivers and Streams (miles)**

| | Fish Consumption | Aquatic Life | Swimming |
|---|---|---|---|
| Supporting | 14,811.6 | 12,377.4 | 2,178.3 |
| Threatened | 0.0 | 134.6 | 0.0 |
| Partially Supporting | 0.0 | 1,003.1 | 456.7 |
| Not Supporting | 124.9 | 1,421.4 | 1,929.4 |
| TOTAL Assessed | 14,936.5 | 14,936.5 | 4,564.4 |

**Table 4**
**Causes of Use Nonsupport in Rivers and Streams**

| Cause Category | Miles Affected: Major Impact | Miles Affected: Moderate/Minor Impact |
|---|---|---|
| Pathogen indicators | 1835.1 | 169.9 |
| Siltation | 1305.8 | 72.0 |
| Organic enrichment/D.O. | 591.3 | 43.4 |
| Nutrients | 325.7 | 109.7 |
| pH | 411.9 | 0.0 |
| Metals | 255.9 | 34.8 |
| Salinity/TDS/Chlorides | 159.5 | 20.1 |
| Turbidity | 234.3 | 0.0 |
| Priority organics | 144.3 | 0.0 |
| Unknown toxicity | 65.3 | 0.0 |
| Habitat alterations | 99.1 | 43.3 |
| Oil and grease | 36.1 | 0.0 |
| Suspended solids | 95.4 | 0.0 |
| Other | 23.4 | 8.2 |

**Table 5**
**Sources of Use Nonsupport in Rivers and Streams**

| Source Category | Miles Affected: Major Impact | Miles Affected: Moderate/Minor Impact |
|---|---|---|
| Point Sources | | |
| Municipal/Package Plants | 1458.0 | 70.8 |
| Industrial | 158.5 | 25.4 |
| Combined sewer overflows | 23.6 | 0.0 |
| TOTAL | 1640.1 | 96.2 |
| Nonpoint Sources | | |
| Resource extraction | 1561.7 | 0.0 |
| Agriculture | 1027.4 | 1077.8 |
| Land disposal/septic tanks | 552.0 | 213.8 |
| Urban Runoff/Storm sewers | 567.4 | 90.5 |
| Hydro-Habitat modification | 81.7 | 68.6 |
| Silviculture | 43.1 | 77.0 |
| Construction/Development | 2.5 | 0.0 |
| TOTAL | 3835.8 | 1527.7 |
| Unknown | 289.2 | 85.1 |

**Table 6**
**Summary of Lake Use Support**

| Degree of Use Support | Assessment Basis (Monitored) | Percent (by acres) |
|---|---|---|
| Acres Fully Supporting | 98,585 | 45 |
| Acres Supporting But Threatened | 94,839 | 44 |
| Acres Partially Supporting | 20,510 | 9 |
| Acres Not Supporting | 3,316 | 2 |
| Total Acres Assessed[a] | 217,250 | |

[a]Total Kentucky Lake Acreage - 228,385

**Table 7**
**Individual Use Support Summary for Lakes**

| Use | Supporting | Supporting But Threatened | Partially Supporting | Not Supporting |
|---|---|---|---|---|
| | | (by Acres[a]) | | |
| Fish Consumption | 209,040 | 0 | 8,210 | 0 |
| Aquatic Life | 157,084 | 49,239 | 7,885 | 3,042 |
| Swimming | 217,031 | 0 | 219 | 0 |
| Secondary Contact | 119,528 | 93,700 | 4,022 | 0 |
| Drinking Water[b] | 186,757 | 0 | 1,572 | 274 |
| | | (by Number[c]) | | |
| Fish Consumption | 102 | 0 | 1 | 0 |
| Aquatic Life | 79 | 2 | 19 | 3 |
| Swimming | 101 | 0 | 2 | 0 |
| Secondary Contact | 89 | 2 | 12 | 0 |
| Drinking Water[d] | 32 | 0 | 7 | 2 |

[a]Total Assessed Acres = 217,250
[b]Total Assessed Acres for Domestic Water Supply = 188,603
[c]Total Assessed Lakes = 103
[d]Total Assessed for Domestic Water Supply = 41

**Table 8**
**Lakes Not Supporting Uses**

| Lake | Use Not Supported[a] | Reason | Cause | Source |
|---|---|---|---|---|
| Briggs | WAH | Dissolved oxygen severely depleted in hypoliminion | Nutrients | Lake fertilization |
| Corbin | DWS | Chronic taste and odor problems caused by algae | Nutrients | Municipal point sources and Agricultural nonpoint sources |
| Herrington | WAH | Fish kills and dissolved oxygen averaged less than 4 mg/l in epilimnion | Nutrients | Municipal point sources and Agricultural nonpoint sources, septic tanks |
| Loch Mary | DWS | Chronic treatment problems caused by poor water quality | Metals (Mn) and other inorganics (noncarbonate hardness) | Surface mining (abandoned lands) |
| Maůzy | WAH | Dissolved oxygen severely depleted in hypolimnion and averaged less than 4 mg/l in epilmnion | Nutrients | Lake fertilization |

**Table 9**
**Causes of Use Nonsupport[a] In Lakes**

| Major Impact[b] | Number of Lakes Affected | Acres | Percent Contribution (by Acres) |
|---|---|---|---|
| Nutrients | 28 | 9,881 | 40 |
| Priority organics (PCBs) | 1 | 8,210 | 33 |
| Suspended solids | 3 | 3,040 | 12 |
| Organic Enrichment | 1 | 2,242 | 9 |
| Other (shallow lake basin) | 6 | 498 | 2 |
| pH | 1 | 219 | 1 |
| Metals (Mn) | 2 | 452 | 2 |
| Other inorganics (noncarbonate hardness) | 1 | 135 | <1 |

[a] Nonsupport is a collective term for lakes either not supporting or partially supporting uses
[b] No moderate or minor impacts were noted

**Table 10**
**Sources of Use Nonsupport[a] in Lakes**

| Contributions Source | Major Impact (Acres) | Moderate/Minor Impact (Acres) | Percent (by Acres) |
|---|---|---|---|
| Point Sources | | | |
| Industrial | 8,210 | | 27 |
| Municipal/ Package Plants | 3,079 | | 10 |
| Nonpoint Sources | | | |
| Agriculture | 7,729 | | 25 |
| Septic Tanks | 3,781 | 317 | 12 |
| Resource Extraction | 3,394 | | 11 |
| Other | | | |
| Natural | 4,125 | | 13 |
| Lake fertilization | 123 | | <1 |
| In-place contaminants | 140 | | <1 |
| Unknown | 314 | | 1 |

[a]Nonsupport is a collective term for lakes either not supporting or partially supporting uses.

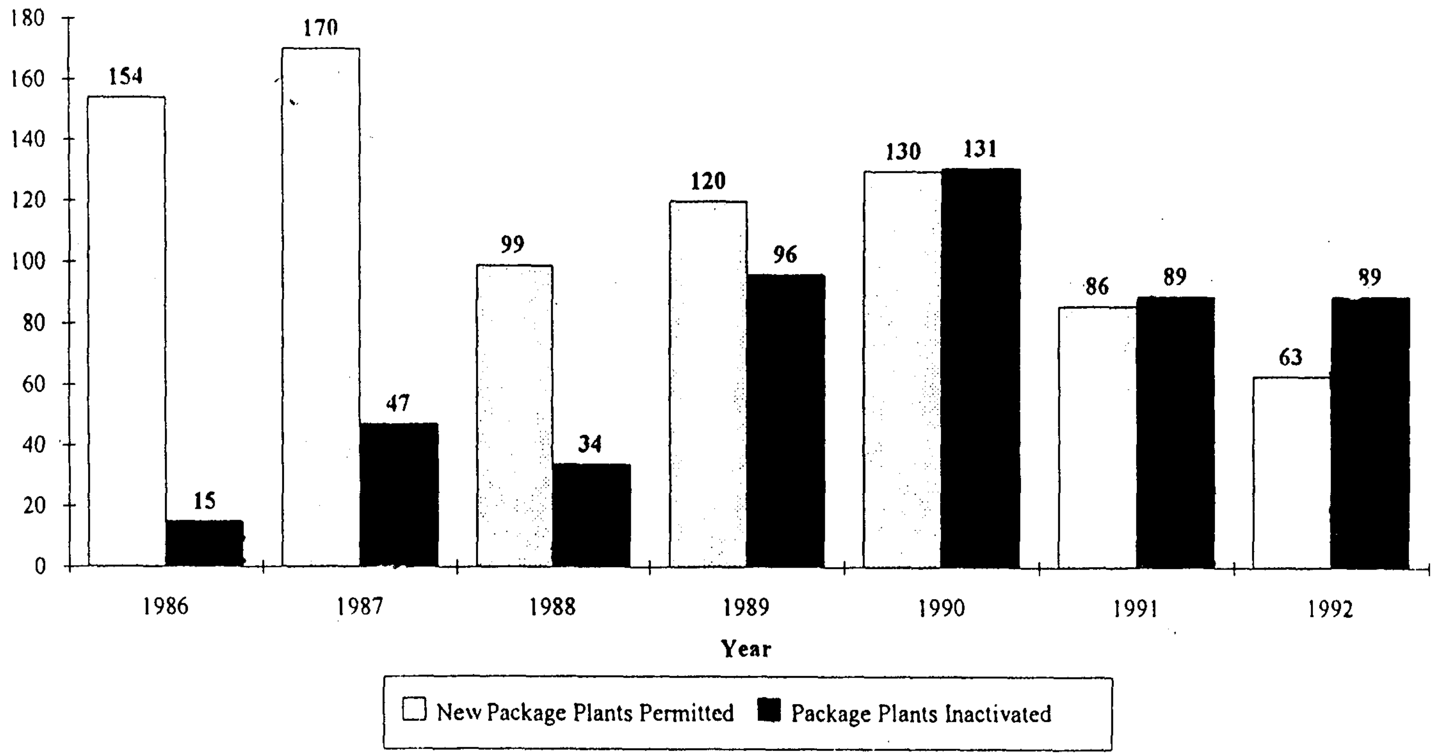
**Table 11**
**Prioritization of Waters for TMDL Development**

| Name | Waterbody Number | Miles |
|---|---|---|
| | **High Priority** | |
| Upper Cumberland River Basin | | |
| Poor Fork | KY5130101-036 | 694.2-719.3 |
| Cumberland River | KY5130101-025 | 650.6-654.4 |
| | KY5130101-032 | 684.9-694.2 |
| Looney Creek | KY5130101-036 | 0-3.5 |
| Salt River Basin | | |
| Chenoweth Run | KY5140102-010 | |
| | **Medium Priority** | |
| Big Sandy River Basin | | |
| Tug Fork | KY5070201-001 | |
| Coldwater Fork | KY5070201-002 | |
| Wolf Creek | KY5070201-003 | |
| Meathouse Creek | KY5070201-003 | |
| Pigeon Roost Fork & Davis Fk | KY5070201-003 | |
| White Oak Fork | KY5070201-003 | |
| Peter Cave Fork | KY5070201-003 | |
| Emily Creek | KY5070201-003 | |
| Levisa Fork | KY5070203-001 | |
| Levisa Fork | KY5070203-016 | |
| Middle Creek | KY5070203-014 | |
| Left Fork Middle Creek | KY5070203-014 | |
| Ohio River Tributaries | | |
| Mill Creek | KY5140101-001 | |
| South Fork Beargrass Creek | KY5140101-002 | |
| Middle Fork Beargrass Creek | KY5140101-002 | |
| Goose Creek | KY5140101-003 | |
| Kentucky River Basin | | |
| Leatherwood Creek | KY5100201-018 | |
| Little Leatherwood Creek | KY5100201-018 | |
| Clarks Run | KY5100205-039 | |

**Table 11 (Cont.)**

| **Name** | **Waterbody Number** | **Miles** |
|---|---|---|
| Licking River Basin | | |
| Allison Creek | KY5100101-018 | |
| Doty Creek | KY5100101-018 | |
| Green River Basin | | |
| Lewis Creek | KY5110003-002 | |
| Pond Creek | KY5110003-003 | |
| Bat East Creek | KY5110003-003 | |
| Sandlick Creek | KY5110005-003 | |
| Buck Creek | KY5110005-016 | |
| West Fork Buck Creek | KY5110005-016 | |
| Cypress Creek | KY5110006-002 | |
| Harris Branch | KY5110006-002 | |
| Flat Creek | KY5110006-005 | |
| UT to Flat Creek | KY5110006-005 | |
| Drakes Creek | KY5110006-006 | |
| Loch Mary Lake | KY5140205-008L02 | |
| Upper Cumberland River Basin | | |
| Left Fork Straight Creek | KY5130101-030 | |
| Martins Fork | KY5130101-038 | |
| Cranks Creek | KY5130101-038 | |
| Rock Creek | KY5130104-007 | |
| Roaring Paunch Creek | KY5130104-008 | |
| Bear Creek | KY5130104-009 | |
| Corbin Lake | KY5130101-006L01 | |
| Salt River Basin | | |
| Pond Creek | KY5140102-002 | |
| Northern Ditch of Pond Creek and Fern Creek | KY5140102-002 | |
| Southern Ditch Pond Creek | KY5140102-002 | |
| Spring Ditch Pond Creek | KY5140102-002 | |
| Fishpool Creek | KY5140102-002 | |
| Brooks Run | KY5140102-009 | |
| Tradewater River Basin | | |
| Crab Orchard Creek | KY5140205-003 | |
| Vaughn Ditch | KY5140205-003 | |
| Clear Creek | KY5140205-008 | |
| Lick Creek | KY5140205-008 | |
| Caney Creek | KY5140205-015 | |
| Buffalo Creek | KY5140205-016 | |

## Figure 1
**New Package Plant Permits v. Inactivations**
**1986-1992**



## APPENDIX A
## TMDL SUBMITTALS AND EPA RESPONSES

PHILLIP J. SHEPHERD
SECRETARY

BRERETON C. JONES
GOVERNOR

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
FRANKFORT OFFICE PARK
14 REILLY ROAD
FRANKFORT, KENTUCKY 40601

October 7, 1994

Jim Greenfield
US EPA
345 Courtland Street
Atlanta, Georgia 30365

Dear Jim:

Attached are two copies each of several reports of studies conducted in Kentucky over the past several years, and we request that EPA review these as official TMDL studies. You have seen some of these previously, but we had not formally requested TMDL consideration. All of these reflect known problems, intensive data collection to further define the problem and identify sources, and recommend solutions. We are currently implementing many of these solutions, or in some cases have already done so.

1) Removing Fecal Pollution from the North Fork Kentucky River Basin; Sept. 1994.
2) Sources and Loadings of Total Phosphorus into Taylorsville Lake; Sept. 1993.
3) Water Quality Study of Harrods Creek; Oct. 1990.
4) Water Quality Study of Floyds Fork; Dec. 1991.
5) Water Quality Study of the East Fork Little Sandy River; Feb. 1992.
6) Water Quality Study of Mayfield Creek near Mayfield, KY; March 1992.

If you have any questions concerning this submittal, please call me at (502) 564-3410.

Sincerely,

David Leist

Dave Leist
Division of Water

DL:mw

Attachments

cc: Terry Anderson

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

JAN 31 1995

Mr. Jack Wilson, Director
Division of Water
Natural Resources and Environmental
Protection Cabinet
Dept. for Environmental Protection
14 Reilly Road
Frankfort, KY 40601

Dear Mr. Wilson:

I am pleased to inform you of the U.S. Environmental Protection Agency's approval of the Total Maximum Daily Load (TMDL) for the North Fork Kentucky River Basin, dated September 1994. The TMDL/water quality strategy recommends that all point discharges meet water quality standard for fecal coliform with strict enforcement by the Commonwealth. Communities in the basin will receive educational, technical, and limited financial assistance regarding fecal contamination from non-point sources.

We are approving the TMDL as being in full compliance with Section 303(d) of the Clean Water Act, which requires that TMDLs be established at levels necessary to implement the applicable water quality standards.

We commend the Division of Water in its efforts to develop a TMDL strategy for the North Fork Kentucky River Basin. We look forward to working with the Division in future TMDL efforts. For your information, we have enclosed a fact sheet which summarizes the information and strategy contained in this TMDL. If you have any questions regarding this action, please ask your staff to call Virginia Buff at (404) 347-2126 ext 6602.

Sincerely yours,

R F McGhee

Robert F. McGhee
Acting Director
Water Management Division

Enclosure

cc: David Leist, DOW

# North Fork Kentucky River TMDL Fact Sheet

| | |
|---|---|
| Project Name: | North Fork Kentucky River Fecal Coliform TMDL |
| Location: | Southeastern Kentucky draining the counties of Letcher, Perry, Breathitt, and Lee |
| Scope/Size: | TMDL covers all 162.6 miles of the North Fork Kentucky River and its tributaries |
| TMDL Issues: | PS/NPS |
| Data Sources: | Ambient monitoring, Intensive surveys, municipal facilities' monitoring, and compliance sampling surveys |
| Monitoring Plan: | Monthly sampling of the upper North Fork Kentucky River main stem during PCR season and random compliance sampling inspections at wastewater plants |
| Control Measures: | NPDES Permits and Enforcement. Local communities will receive educational, technical, and limited financial assistance regarding fecal contamination from non-point sources. |
| TMDL Development: | In 1987, ambient monitoring indicated excessive levels of fecal coliform (FC) caused violations of the FC standard for the North Fork Kentucky River. Several intensive surveys and follow-up monitoring indicated that the majority of the pollution was coming from wastewater plants. All point sources are required to meet the FC standard (400/100 ml) prior to discharge. Strict enforcement of the NPDES permits resulted in improvement of the river, however due to numerous raw discharges from households the standard was still being violated. Education and other forms of assistance will be provided to local residents in order to reduce the fecal contamination from the direct pipe sources. |
| Implementation Controls: | Fines, compliance inspections and monitoring have reduced the level of fecal contamination from wastewater plants. Strict enforcement of NPDES permits will continue. Communities will receive educational, technical and financial assistance regarding non-point sources of fecal contamination. |

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET. N.E.
ATLANTA. GEORGIA 30365

JAN 31 1995

Mr. Jack Wilson, Director
Division of Water
Natural Resources and Environmental
 Protection Cabinet
Dept. for Environmental Protection
14 Reilly Road
Frankfort, KY 40601

Dear Mr. Wilson:

I am pleased to inform you of the U.S. Environmental Protection Agency's approval of the Total Maximum Daily Load (TMDL) for the East Fork of the Little Sandy River. The TMDL/water quality strategy recommends elimination of all wastewater treatment plants in the basin. Wastewater will be routed to a regional facility near Ashland with discharge to the Ohio River.

We are approving the TMDL as being in full compliance with Section 303(d) of the Clean Water Act, which requires that TMDLs be established at levels necessary to implement the applicable water quality standards.

We commend the Division of Water in its efforts to develop a TMDL strategy for the East Fork of the Little Sandy River. We look forward to working with the Division in future TMDL efforts. For your information, we have enclosed a fact sheet which summarizes the information and strategy contained in this TMDL. If you have any questions regarding this action, please ask your staff to call Virginia Buff at (404) 347-2126 ext 6602.

Sincerely yours,

R F McGhee

Robert F. McGhee
Acting Director
Water Management Division

Enclosure

cc: David Leist, DOW

East Fork Little Sandy River TMDL Fact Sheet

| | |
|---|---|
| Project Name: | East Fork Little Sandy River Dissolved Oxygen TMDL |
| Location: | Boyd County, KY |
| Scope/Size: | River mile 25 to mile 19 of the East Fork Little Sandy River near Ashland, KY |
| TMDL Issues: | Point Source |
| Data Sources: | Ambient monitoring and 1991 water quality survey |
| Data Mechanism: | KY QUAL2E predictive modelling and in stream monitoring |
| Control Measures: | NPDES Permits |
| Summary: | In 1991 KY DOW collected water quality data on the East Fork Little Sandy River to verify a predictive QUAL2E model run. As expected dissolved oxygen (D.O.) violations were found along the East Fork Little Sandy River and Shope Creek near Ashland. Forty wastewater package plants ranging in size from 500 gallons per day (gpd) to 50,000 gpd discharge in the area and contribute pollutants resulting in violations of the D.O. standard. The model run and survey showed that the critical condition for D.O. is during high temperatures (summer) and low flow conditions. |
| TMDL Development: | Due to the small size, improper maintenance and poor operation of the package plants, it was concluded that the best TMDL strategy would be to eliminate all the package plants and send the flows to a regional facility near Ashland discharging to the Ohio River. Thus, the TMDL for point source discharge is 0 mg/l for BOD5 and ammonia for the East Fork Little Sandy River. |
| Implementation Controls: | The DOW will not permit new wastewater discharges or approve a plant expansion in the referenced basin. All existing dischargers will be required to tie into the regional sewer line. The project should be completed by 1997. Monitoring of the stream is planned after removal of the dischargers. |

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

APR 10 1995

Mr. Jack Wilson, Director
Division of Water
Natural Resources and Environmental
Protection Cabinet
Dept. for Environmental Protection
14 Reilly Road
Frankfort, KY 40601

Dear Mr. Wilson:

I am pleased to inform you of the U.S. Environmental Protection Agency's approval of the Total Maximum Daily Load (TMDL) for Harrods Creek in Oldham and Jefferson Counties. The TMDL/Water Quality Strategy recommends elimination of all small wastewater treatment plants discharging to lower Harrods Creek and those discharging above Sleepy Hollow Lake. Wastewater in lower Harrods Creek will be routed to the regional Morris Forman plant on the Ohio River and wastewater plants above Sleepy Hollow Lake will be routed to the regional advanced waste treatment facility located on Hite Creek.

We are approving the TMDL as being in full compliance with Section 303(d) of the Clean Water Act, which requires that TMDLs be established at levels necessary to implement the applicable water quality standards.

We commend the Division of Water in its efforts to develop a TMDL strategy for Harrods Creek. We look forward to working with the Division in future TMDL efforts. For your information, we have enclosed a fact sheet which summarizes the information and strategy contained in this TMDL. If you have any questions regarding this action, please ask your staff to call Virginia Buff at (404) 347-2126 ext. 6602.

Sincerely yours,

Allen E. Antley Jr.

Robert F. McGhee
Acting Director
Water Management Division

Enclosure

cc: David Leist

# Harrods Creek TMDL Fact Sheet

| | |
|---|---|
| Project Name: | Harrods Creek Dissolved Oxygen TMDL |
| Location: | Oldham and Jefferson Counties, Kentucky |
| Scope/Size: | River mile point 7.5 to mile point 0 of Harrods Creek which flows into the Ohio River. Due to downstream dams and locks in the Ohio River water in Harrods Creek will slow down or reverse (backwater). |
| TMDL Issues: | Point Source |
| Data Sources: | Ambient monitoring and 1990 water quality survey |
| Data Mechanism: | KY QUAL2E predictive modeling and in-stream monitoring |
| Control Measures: | KPDES Permits |
| Summary: | In 1990 KY DOW collected water quality data on Harrods Creek to examine D.O. from mile point (MP) 0 to MP 12. Of primary concern is the backwater area (MP 0 to MP 4.2) where a D.O. sag below the D.O. standard was measured for nearly 3 miles. Eight package plants in or near the backwater area contribute oxygen consuming constituents, BOD5 and ammonia, to Harrods Creek. Predictive model runs showed that if these 8 small plants are removed from lower Harrods Creek, D.O. will be maintained at the 5.0 mg/l standard. The model run and survey showed that the critical condition for D.O. is during high temperatures (summer) and low flow conditions. Also, a number of small package plants discharging above Sleepy Hollow Lake will be removed. |
| TMDL Development: | The TMDL strategy calls for elimination of the 8 package plants in the backwater area of Harrods Creek. Flows will be sent to a regional plant located on the Ohio River in another basin. Wastewater plants upstream from Sleepy Hollow Lake have also been recommended for removal. Flows from these plants will be rerouted to the Hite Creek regional plant. KY QUAL2E modeling predicts that the in-stream D.O. standard will be maintained at effluent limits of CBOD5 = 10 mg/l, NH3-N = 2 mg/l and D.O. = 7 mg/l for the Hite Creek plant and no discharge allowed from the other 8 backwater plants and the plants upstream from Sleepy Hollow Lake. |

| | |
|---|---|
| Implementation Controls: | The facility owners with plants in or near the backwater area of Harrods Creek have already been contacted and informed that their current NPDES permits will not be renewed. Existing permits will expire in mid-1998.<br><br>Monitoring of Harrods Creek is planned after removal of the dischargers. Based on that information it will be determined if additional point source or non-point source controls are needed. |

# APPENDIX B
# U.S. GEOLOGICAL SURVEY WORKPLAN FOR HERRINGTON LAKE TMDL PROJECT

# WORK PLAN

## TMDL Study of Phosphorus Concentrations in Herrington Lake, Kentucky

---

## Statement of Problem

The upper reaches of this central-Kentucky lake are fed primarily by the Dix River and Clarks Run. Recent sampling results indicate that the upper portion of the lake is hypereutrophic, while other areas of the lake are eutrophic. Documented results of this problem include fish kills and average dissolved oxygen (DO) concentrations of less than 5 mg/l in the lake's epilimnion. The Kentucky Division of Water (DOW) determined in its 1992 Section 305(b) report that because of these water quality problems Herrington Lake does not support its designated aquatic life use (*Kentucky Report to Congress on Water Quality*, 1992); and the 1992 Section 303(d) report identified the lake as a high priority water body requiring a Total Maximum Daily Load (TMDL) study.

The primary external nutrient causing eutrophication in Herrington Lake is phosphorus from municipal point source discharges, agricultural non-point sources, and septic tanks. The primacy of one of these sources over the other two has not been established, and this lack of information limits the effectiveness of lake and lake basin management decisions regarding effective ways to reduce lake loading. Internal nutrient sources may further confound management decisions, as the internal cycling of nutrients residing in the lake sediments can potentially sustain eutrophic conditions even with significant load reductions from external nutrient sources.

## Objective

The proposed study will determine existing phosphorus loadings, identify the principal sources of this pollutant, and estimate the reductions needed to lower the trophic status of the lake. Based on this information, the DOW will then develop control strategies to bring about the needed reductions.

The data collection and analysis proposed for this project are designed to determine the ***nutrient assimilation capacity*** of Herrington Lake, and from that information to estimate an acceptable nutrient loading rate to the lake. The nutrient assimilation capacity of the lake is the lake's capacity to absorb external nutrient inputs and still maintain an acceptable level of quality. "Acceptable level" may be defined, for example, as a prespecified level of the Carlson Trophic Status Index for Chl $\alpha$, total phosphorus, or Secchi depth. Mathematically it can be shown that the assimilation capacity of the lake can be related to external loading through calculation of an assimilation factor (see Attachment A). Estimation of the assimilation factor will allow the determination of an acceptable external loading rate of nutrients to the lake, "acceptable" being defined as a level that would eventually result in an acceptable level of inlake water quality. Once an acceptable external loading rate is established, sources can be identified and efforts made to reach the loading target.

It is important that a reliable understanding be developed of the relation of external nutrient loading to internal nutrient concentrations and between internal nutrient concentrations and the problems of concern, e.g., algal proliferation. In Herrington Lake, these problems have been identified as fish kills caused by poor water quality and dissolved oxygen concentrations averaging less than 5 mg/l in the epilimnion. It is likely that both of these problems have the same source: nutrient-limited (or insufficiently limited) algal growth.

Consequently, it is important to understand the factors that control algal growth in the system and especially the nutrient algal interaction, for if algal growth is a major cause of the identified problems in Herrington Lake and algal growth in Herrington Lake is nutrient-limited, then nutrient management in Herrington Lake is the key to problem management.

## Approach

Lacking sufficient in-house expertise to carry out the mathematical modeling necessary to complete this project, the DOW will contract the data collection and analysis components to qualified staff in the U.S. Geological Survey (USGS).

The hypothesis for this project is presented in two statements:

(1) nutrient-limited algal growth is primarily responsible for the fish kill problems and the low epilimnetic DO concentrations in the lake, and

(2) the nutrient-algal relation can be adequately described with mathematical formulae.

Details of this hypothesis will be formulated as a conceptual model (see Attachment B) which describes the general relations between nutrients and algae in the lake and its inflows. This modeling effort will require extensive water quality data collection and a thorough statistical analysis of the data. Empirically based models will be developed using the Bathtub and the Eutromod approaches, both of which are recognized and supported by the North American Lake Management Society.

As a supplement to the scope of work proposed for this grant project, the USGS will also calibrate and validate a pair of physically based models: the CE-QUAL W2, supported by the U.S. Army Corps of Engineers, and the WASP, supported by the U.S. EPA, as a means of testing the above hypothesis. To accomplish this project, an intensive data collection program will be linked with the CE-QUAL W2 reservoir model of Herrington Lake and its watershed. This effort will provide an assessment of the nutrient and trophic state dynamics in the lake and link them with land use activities. The program design will result in the calibration of a physically based model capable of simulating pool water volume, surface elevation, water density, vertical and longitudinal velocities, temperature gradients and heat distribution, dissolved oxygen, nutrients, and chlorophyll $\alpha$ concentrations, distributions, and interactions, and predict water quality releases from the reservoir. For this supplemental modeling work, the USGS will commit an additional $130,000 of their own funding.

Input requirements for the modeling include reservoir bathymetry and hydrology, meteorological data, constituent fluxes into and out of the reservoir, and biological and chemical reaction rates. Calibration of the model will require daily average inflows and outflows (for flux estimation) and vertical and longitudinal inlake concentration of constituents (with estimates of variability). Calibration of the physical model will also be accomplished by comparison with sophisticated empirical models developed for the lake, lake quality indices, and phytoplankton community analyses. If agreement between all of these methods can be accomplished for the same data, the models will be considered rigorously tested and useful for making management decisions which may be subject to legal scrutiny and/or litigation.

### Data Collection

The data collection program will be conducted over a two-year time frame with 16 sampling dates each year. Sampling for nutrients including Soluble Reactive Phosphorus (SRP), Non-Soluble Reactive Phosphorus (NSRP), Nitrate Nitrogen, Ammonia Nitrogen, and Total Kjeldahl Nitrogen will be conducted on a bi-weekly basis, beginning the last week of February and ending the first week of November, for five locations within the lake and five inflow stations. Each lake station will be sampled at four depths based on thermal stratification if it exists and at two depths if the lake is not stratified.

The algal community will be characterized by a single integrated sample from the upper three meters of the water column in the lake on each sample date. Algal information will be analyzed as Phytoplankton Biovolume, Community Structure, and Chlorophyll $\alpha$.

Also collected at each site for each sample run will be Dissolved Oxygen, Specific Conductance, Water Temperature, and pH. In the lake sites these four variables will be sampled at vertical intervals adequate to properly characterize the temperature and DO profiles at each site. Secchi depth and fecal coliform data will be collected at each lake site for each run. At each of the inflows, instantaneous discharge will be estimated on each run.

### Sample quantity calculations:

Nutrient sample numbers for inflows:
5 sites x 16 dates x 2 years = **160 samples**

Nutrient sample numbers for the lake (not stratified @ 5 dates):
5 sites x 5 dates x 2 depths x 2 years = **100 samples**

Nutrient sample numbers for the lake (stratified @ 11 dates):
5 sites x 11 dates x 4 depths x 2 years = **440 samples**

**Total nutrient samples = 700**

**Total algal sample numbers = 5 sites x 16 dates x 2 years = 160 samples**

### Project oversight

As the official grant recipient for this project, the DOW will provide staff oversight and management assistance to the contractor to fulfill the obligations of this work plan. DOW personnel will also involve other state and federal agencies early in the planning phases to ensure various interests and concerns are addressed in the project design and implementation. These entities will include the Kentucky Department of Fish and Wildlife Resources, the Kentucky Division of Conservation, the U.S. Soil Conservation Service, and local concerned citizen groups. The DOW will organize various meetings for all interested parties on a quarterly basis, both to inform them of the project and to solicit their input.

Other state and federal agencies will be involved early in the planning phases to ensure various interests and concerns are addressed in the project design. These entities will include the Kentucky Department of Fish and Wildlife Resources, the Kentucky Division of Conservation, the U.S. Soil Conservation Service, and local concerned citizen groups.

## Final Products

A final report will describe the existing problems in Herrington Lake and provide a detailed analysis of the sources of these problems. The report will be used in making permit decisions for point source discharges, and will serve as a reference for all agencies and citizen groups involved with reducing nonpoint contributions.

DOW will review this report and work to implement the recommendations through the various programs of the division, e.g., nonpoint source and point source pollution control.

During the course of this project, quarterly progress reports will be submitted to update the EPA on the status of grant efforts.

The DOW will also monitor Herrington Lake for a number of years following the project to determine the effectiveness of the control measures once implemented, and will institute further controls if necessary. In addition, the DOW will be able to transfer the modeling methods learned in implementing the Herrington Lake project to other watersheds around the Commonwealth.

## Milestones

Begin literature review ........ July 1994
Begin meeting quarterly with other state and federal agencies and interested parties ........ July 1994
Begin stream data collection ........ October 1994
Begin data analysis ........ February 1995
Begin model development ........ February 1995
Begin preparing report ........ January 1996
Begin model calibration (USGS contribution) ........ March 1996
Begin model validation (USGS contribution) ........ May 1996
Complete stream data collection ........ September 1996
Complete model calibration (USGS contribution) ........ February 1997
Complete model validation (USGS contribution) ........ June 1997
Complete study report ........ September 1997

## Budget

The budget for this project is presented below.

| | |
|---|---|
| Salary and Fringe (.15 Person Year, Grade 15 at $42,480) | $6,408 |
| Indirect (35.92%) | $3,592 |
| Contractual (USGS) | $235,000 |
| **TOTAL** | **$245,000** |

The USGS, as the contractor for the data collection and analysis component of this project, will also calibrate and validate two physically based models as detailed in the "Approach" section of this work plan, for a total cost of $130,000 of their own funding.

# ATTACHMENT A

**Equation 1**

$$\phi = \frac{external\ loading}{acceptable\ level\ of\ water\ quality}$$

where $\phi$ = assimilation factor $[MT^{-1}\ (ML^{-3})^{-1}]$ which is the net effect of all processes (transport or kinetic) which remove the nutrient of interest from the lake system.

Calculation of $\phi$ in a generalized model can be accomplished using the following equation:

**Equation 2**

$$\phi = W_o + \left[\left(\frac{v_1}{z}F_1 + \frac{v_4}{z}F_4\right)v_{t,w}\right] - R_1$$

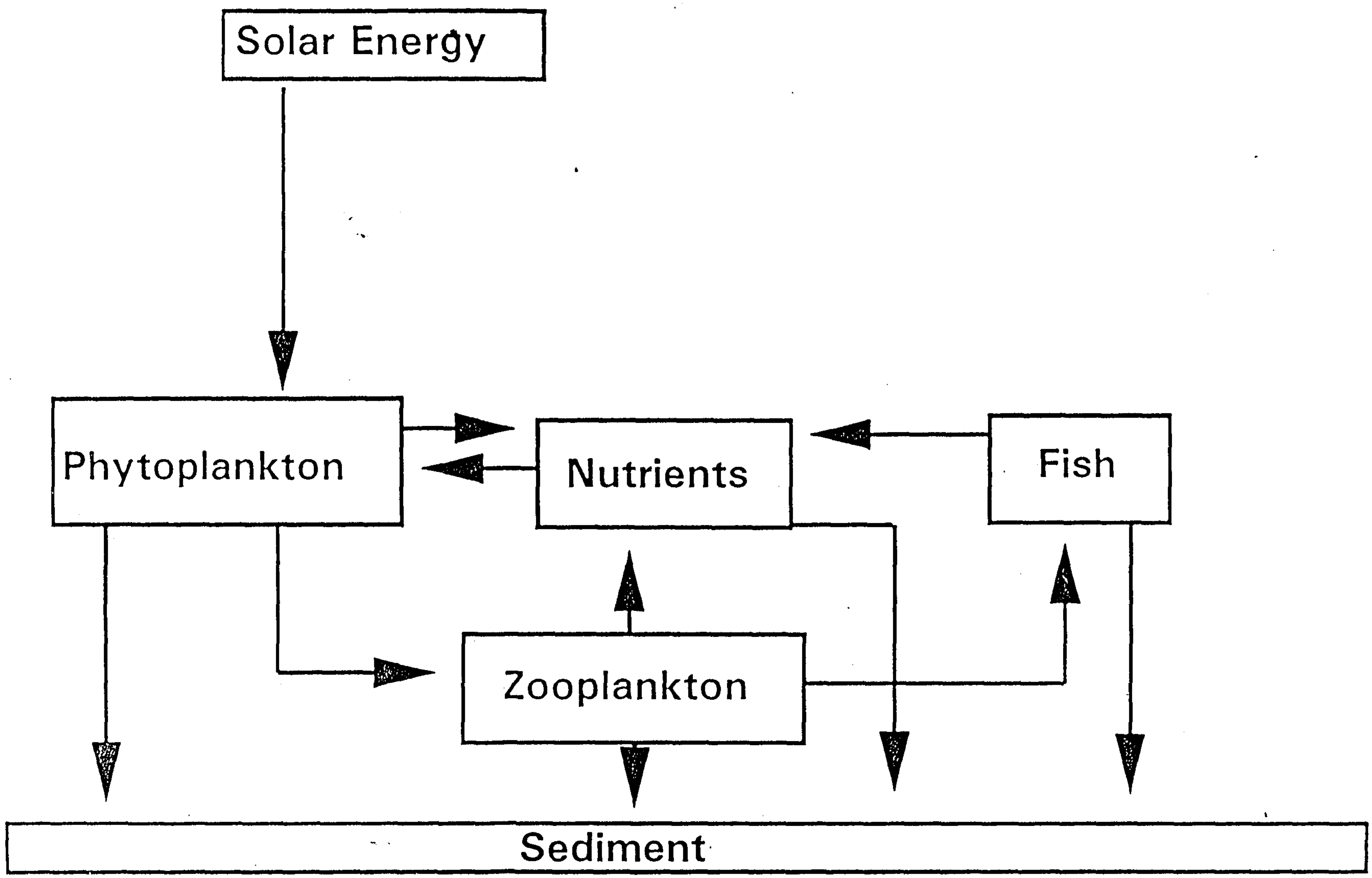
where

$W_o$ = flux of nutrient out of system
$v_1$, $v_4$ = settling velocities of phytoplankton and detritus / mineral matter, respectively
$F_1$, $F_4$ = fractions of the total nutrient in phytoplankton and detrital / mineral matter forms, respectively
$R_1$ = recycling of nutrient within water column or from sediment

The acceptable external loading rate of nutrients to the lake is shown by the rearrangement of Equation 1.

$$external\ loading = \phi(acceptable\ level\ of\ water\ quality)$$

# Mass and Energy Flow Model for Reservoir Plankton




ATTACHMENT B

PHILLIP J. SHEPHERD
SECRETARY

BRERETON C. JONES
GOVERNOR

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
OFFICE OF THE SECRETARY
FRANKFORT KENTUCKY 40601
TELEPHONE: (502) 564-3350

August 22, 1994

Mr. Hector Buitrago
Grants Specialist
Grants and IAG Operations Unit
U.S. Environmental Protection Agency
345 Courtland Street, N.E.
Atlanta, Georgia 30365

Dear Mr. Buitrago:

Enclosed is an original signed Grant Agreement #CP994584-94 for the Section 104(b)(3) NPDES Program Implementation grant to conduct a TMDL study of Phosphorus Concentration in Herrington Lake in Kentucky. On behalf of the Commonwealth of Kentucky, I am pleased to accept this award for $245,000.

I appreciate the Environmental Protection Agency's support of Kentucky's efforts to protect and study the water quality of the Commonwealth. If you have any questions or concerns, please contact Tonya Sangester at (502) 564-3410.

Sincerely,

Phillip J. Shepherd

PJS/trs

Enclosure

cc: Grace Deatrick
David Leist

# APPENDIX C
# LIST OF STREAMS (OTHER THAN OHIO RIVER) NOT SUPPORTING USES BY RIVER BASIN

List of Streams Not Supporting Uses by River Basin (Continued)

| Stream (Waterbody I.D.) | | Uses Not Supported: Aquatic Life (miles) | Cause | Source | Swimming (miles) | Cause | Source |
|---|---|---|---|---|---|---|---|
| **Big Sandy River Basin** | | | | | | | |
| Tug Fork | (KY5070201-001) (KY5070201-004) | 10.3(E)* | Siltation | Mining/ Silviculture | 57.9(M,**E) | Pathogens | Package Plants/ Septic Tanks/ Agriculture |
| Road Fork | (KY5070201-002) | 2.1(E) | Siltation | Mining | | | |
| Straight Fork Road | (KY5070201-002) | 1.6(E) | Siltation | Mining | | | |
| Coldwater Fork | (KY5070201-002) | 8.5(E) | Siltation/pH/ Metals/Suspended Solids/Chlorides | Mining/ Petroleum Activities | 8.5(E) | pH | Mining |
| Wolf Creek | (KY5070201-003) | 20.5(E) | Siltation/pH/ Metals/Turbidity | Mining | 20.5(E) | pH | Mining |
| Meathouse Creek | (KY5070201-003) | 4.3(E) | Siltation/pH/ Metals/Turbidity | Mining | 4.3(E) | pH | Mining |
| Pigeon Roost Fork & Davis Fork | (KY5070201-003) | 9.8(E) | Siltation/pH/ Metals/Turbidity | Mining | 9.8(E) | pH | Mining |
| White Oak Fork | (KY5070201-003) | 6.0(E) | Siltation/pH/ Metals/Turbidity | Mining | 6.0(E) | pH | Mining |
| Peter Cave Fork | (KY5070201-003) | 6.6(E) | Siltation/pH/ Metals/Turbidity | Mining | 6.6(E) | pH | Mining |
| Emily Creek | (KY5070201-003) | 7.0(E) | Siltation/pH Metals/Turbidity | Mining | 7.0(E) | pH | Mining |

List of Streams Not Supporting Uses by River Basin (Continued)

| Stream (Waterbody I.D.) | | Aquatic Life (miles) | Cause | Source | Swimming (miles) | Cause | Source |
|---|---|---|---|---|---|---|---|
| | | Uses Not Supported | | | | | |
| **Big Sandy River Basin (Continued)** | | | | | | | |
| Big Creek | (KY5070201-005) | 19.7(E) | Siltation | Agriculture/ Mining | | | |
| Knox Creek | (KY5070201-010) | | | | 7.6(E) | Pathogens | Agriculture/Septic Tanks |
| Levisa Fork | (KY5070202-001) (KY5070203-001) (KY5070203-010) (KY5070203-016) (KY5070203-021) | 33.5(E) | Siltation/ Turbidity | Mining | 65.1(M) | Pathogens | Package Plants/ Septic Tanks Agriculture |
| Bull Creek | (KY5070203-017) | 7.2(E) | Siltation/Habitat Alterations | Mining/ Streambank Modification | | | |
| Shelby Creek | (KY5070202-002) | | | | 10.0(E) | Pathogens | Package Plants |
| Greasy Creek | (KY5070202-003) | 7.2(E) | Siltation | Mining | | | |
| Russell Fork | (KY5070202-004) | | | | 16.0(E) | Pathogens | Municipal/Package Plants/Septic Tanks/ Agriculture |
| Elkhorn Creek | (KY5070202-005) | | | | 27.4(E) | Pathogens | Package Plants |
| Paint Creek | (KY5070203-005) | | | | 1.0(E) | Pathogens | Urban Runoff/ Storm Sewers |
| Jennys Creek | (KY5070203-006) | 11.0(E) | Siltation | Road Construction | | | |

List of Streams Not Supporting Uses by River Basin (Continued)

| Stream (Waterbody I.D.) | | Uses Not Supported: Aquatic Life (miles) | Cause | Source | Swimming (miles) | Cause | Source |
|---|---|---|---|---|---|---|---|
| **Big Sandy River Basin (Continued)** | | | | | | | |
| Lick Fork | (KY5070203-006) | 7.8(E) | Siltation | Road Construction | | | |
| Mudlick Creek | (KY5070203-007) | 11.0(E) | Siltation | Mining | | | |
| Brushy Fork | (KY5070203-013) | 18.5(E) | Siltation/ Turbidity | Mining | | | |
| Buffalo Creek | (KY5070203-013) | 10.9(E) | Siltation/ Turbidity | Mining | | | |
| John Creek | (KY5070203-013) | 44.7(E) | Siltation/ Turbidity | Mining | | | |
| Left Fork Brushy | (KY5070203-013) | 8.0(E) | Siltation/ Turbidity | Mining | | | |
| Raccoon Creek | (KY5070203-013) | 11.0(E) | Siltation/ Turbidity | Mining | | | |
| Middle Creek | (KY5070203-014) | 18.0(E) | Siltation/pH | Mining | 18.0(E) | pH | Mining |
| Left Fork Middle Creek | (KY5070203-014) | 9.5(E) | Siltation/pH | Mining | 9.5(E) | pH | Mining |
| Beaver Creek | (KY5070203-018) | 7.0(E) | Siltation | Mining/ Streambank Modification | 7.0(E) | Pathogens | Package Plants/ Municipal |
| Left Fork Beaver Creek | (KY5070203-020) | 28.0(E) | Siltation | Mining | | | |

List of Streams Not Supporting Uses by River Basin (Continued)

| | | Uses Not Supported | | | | | |
|---|---|---|---|---|---|---|---|
| Stream | (Waterbody I.D.) | Aquatic Life (miles) | Cause | Source | Swimming (miles) | Cause | Source |
| **<u>Big Sandy River Basin (Continued)</u>** | | | | | | | |
| Big Sandy | (KY5070204-001) | | | | 26.8(M) | Pathogens | Municipal/Package Plants/Septic Tanks/Agriculture |
| **<u>Little Sandy River Basin</u>** | | | | | | | |
| East Fork Little Sandy River | (KY5090104-003) | 6.0(M) | Organic Enrichment | Package Plants | | | |
| Shope Creek | (KY5090104-003) | 5.4(M) | Organic Enrichment | Package Plants | | | |
| Newcombe Creek | (KY5090104-009) | 11.9(M) | Chlorides | Petroleum Activities | | | |
| **<u>Licking River Basin</u>** | | | | | | | |
| Licking River | (KY5100101-001) (KY5100101-004) (KY5100101-015) (KY5100101-034) | 6.3(M) | Metals | Unknown | 98.1(M) | Pathogens | Municipal/Package Plants/Septic Tanks/Agriculture/ Combined Sewer Overflows |
| | (KY5100101-039) | 33.4(E) | Siltation | Mining | | | |
| North Fork Licking River | (KY5100101-012) | | | | 51.3(M) | Pathogens | Agriculture |
| Banklick Creek | (KY5100101-002) | | | | 19.0(M) | Pathogens | Combined Sewer Overflows |

## List of Streams Not Supporting Uses by River Basin (Continued)

| | | Uses Not Supported | | | | | |
|---|---|---|---|---|---|---|---|
| Stream | (Waterbody I.D.) | Aquatic Life (miles) | Cause | Source | Swimming (miles) | Cause | Source |
| **Licking River Basin (Continued)** | | | | | 4.7(M) | Pathogens | Urban Runoff/ Storm Sewers |
| Three-Mile Creek | (KY5100101-003) | | | | | | |
| Fleming Creek | (KY5100101-018) | | | | 16.5(M) | Pathogens | Agriculture/ Pasture Land/ Feedlots |
| Sleepy Run | (KY5100101-018) | | | | 3.0(M) | Pathogens | Pasture Land/Feedlots |
| Wilson Run | (KY5100101-018) | | | | 5.1(M) | Pathogens | Pasture Land/Feedlots |
| Town Branch | (KY5100101-018) | | | | 4.0(M) | Pathogens | Pasture Land/Feedlots |
| Allison Creek | (KY5100101-018) | 4.7(M) | Organic enrichment | Nutrients/Organic Enrichment/Noxious Aquatic Plants | 4.7(M) | Pathogens | Pasture Land/Feedlots |
| Doty Creek | (KY5100101-018) | 4.0(M) | Organic enrichment | Pasture Land/ Feedlots | 4.0(M) | Pathogens | Pasture Land/Feedlots |
| Lick Creek | (KY5100101-037) | 9.2(E) | Chlorides | Petroleum Activities | | | |
| Raccoon Creek | (KY5100101-037) | 5.2(E) | Chlorides | Petroleum Activities | | | |
| Burning Fork | (KY5100101-038) | 7.5(E) | Chlorides | Petroleum Activities | | | |

List of Streams Not Supporting Uses by River Basin (Continued)

| Stream (Waterbody I.D.) | | Aquatic Life (miles) | Cause | Source | Swimming (miles) | Cause | Source |
|---|---|---|---|---|---|---|---|
| | | Uses Not Supported | | | | | |
| **Licking River Basin (Continued)** | | | | | | | |
| State Road Fork | (KY5100101-038) | 5.1(E) | Chlorides | Petroleum Activities | | | |
| Rockhouse Fork | (KY5100101-038) | 5.0(E) | Chlorides | Petroleum Activities | | | |
| Puncheon Camp Cr | (KY5100101-039) | 4.7(E) | Siltation | Mining | | | |
| Trace Fork | (KY5100101-039) | 8.4(E) | Siltation | Mining | | | |
| South Fk. Licking River | (KY5100102-001) | | | | 15.6(M) | Pathogens | Agriculture |
| Indian Creek | (KY5100102-009) | | | | 0.6(E) | Pathogens | Municipal |
| Stoner Creek | (KY5100102-012) | | | | 9.6(E) | Pathogens | Agriculture/Urban Runoff |
| Houston Creek | (KY5100102-013) | | | | 14.0(E) | Pathogens | Agriculture |
| Hancock Creek | (KY5100102-017) | | | | 7.6(E) | Pathogens | Package Plants/ Urban Runoff/Storm Sewers |
| Strodes Creek | (KY5100102-017) | | | | 26.5(E) | Pathogens | Agriculture/Package Plants/Urban Runoff/Storm Sewers |
| Hinkston Creek | (KY5100102-024) | | | | 19.8(E) | Pathogens | Municipal/Package Plants/Agriculture |

List of Streams Not Supporting Uses by River Basin (Continued)

| | | Uses Not Supported | | | | | |
|---|---|---|---|---|---|---|---|
| Stream (Waterbody I.D.) | | Aquatic Life (miles) | Cause | Source | Swimming (miles) | Cause | Source |
| **Kentucky River Basin** | | | | | | | |
| North Fork Kentucky River | (KY5100201-010)<br>(KY5100201-012)<br>(KY5100201-017)<br>(KY5100201-022) | 108.2(E) | Siltation | Mining | 86.4(M) | Pathogens | Municipal/Package Plants/Septic Tanks |
| Cane Creek | (KY5100201-006) | | | | 9.5(M) | Pathogens | Agriculture/Septic Tanks |
| Spring Fork Quicksand Creek | (KY5100201-007) | 15.0(E) | Siltation | Mining | | | |
| Lost Creek | (KY5100201-009) | 18.5(E) | Siltation | Mining | | | |
| Troublesome Creek | (KY5100201-009) | | | | 49.5(M) | Pathogens | Package Plants/ Municipal/Septic Tanks/Urban Runoff/Storm Sewers |
| Grapevine Creek | (KY5100201-011) | 8.5(E) | Siltation | Mining | | | |
| Big Creek | (KY5100201-011) | 9.6(E) | Siltation | Mining | | | |
| Carr Fork | (KY5100201-014) | | | | 8.7(M) | Pathogens | Septic Tanks |

List of Streams Not Supporting Uses by River Basin (Continued)

| Stream (Waterbody I.D.) | | Uses Not Supported: Aquatic Life (miles) | Cause | Source | Swimming (miles) | Cause | Source |
|---|---|---|---|---|---|---|---|
| **Kentucky River Basin (Continued)** | | | | | | | |
| Leatherwood Creek | (KY5100201-018) | 13.9(E) | Siltation/pH/ Metals/Suspended Solids | Mining | 13.9(E) | pH | Mining |
| Little Leatherwood Ck | (KY5100201-018) | 6.6(E) | Siltation/pH/ Metals/Suspended Solids | Mining | 6.6(E) | pH | Mining |
| Turkey Creek | (KY5100201-019) | 6.4(E) | Siltation | Mining | | | |
| Maces Creek | (KY5100201-020) | 6.8(E) | Siltation | Mining | | | |
| Bull Creek | (KY5100201-020) | 5.3(E) | Siltation | Mining | | | |
| Stratton Fork | (KY5100201-020) | 7.0(E) | Siltation | Mining | | | |
| Rockhouse Creek | (KY5100201-021) | 24.3(E) | Siltation | Mining | | | |
| Kings Creek | (KY5100201-022) | 6.5(E) | Siltation | Mining | | | |
| Smoot Creek | (KY5100201-022) | 7.4(E) | Siltation | Mining | | | |
| Boone Fork | (KY5100201-022) | 3.3(E) | Siltation | Mining | | | |
| Yonts Creek | (KY5100201-022) | 3.4(E) | Siltation | Mining | | | |
| Wright Fork | (KY5100201-022) | 4.7(E) | Siltation | Mining | | | |
| Middle Fork Kentucky River | (KY5100202-004) (KY5100202-007) | 27.1(E) | Siltation | Mining | | | |

List of Streams Not Supporting Uses by River Basin (Continued)

| Stream | (Waterbody I.D.) | Uses Not Supported: Aquatic Life (miles) | Cause | Source | Swimming (miles) | Cause | Source |
|---|---|---|---|---|---|---|---|
| **Kentucky River Basin (Continued)** | | | | | | | |
| Cutshin Creek | (KY5100202-006) | 28.8(E) | Oil and Grease/ Siltation | Petroleum Activities/Mining | | | |
| Raccoon Creek | (KY5100202-006) | 7.3(E) | Oil and Grease/ Siltation | Petroleum Activities/Mining | | | |
| Billey Fork | (KY5100204-009) | 8.1(M) | Chlorides | Petroleum Activities | | | |
| Millers Creek | (KY5100204-009) | 6.4(M) | Chlorides/Siltation | Petroleum Activities/ Silviculture | | | |
| Big Sinking Creek | (KY5100204-009) | 14.1(M) | Chlorides | Petroleum Activities | | | |
| Bald Rock Fork | (KY5100204-009) | 1.7(E) | Chlorides | Petroleum Activities | | | |
| Right Fork Zachariah | (KY5100204-009) | 1.3(E) | Chlorides | Petroleum Activities | | | |
| Left Fork Zachariah | (KY5100204-009) | 1.3(E) | Chlorides | Petroleum Activities | | | |
| Red River | (KY5100204-013) | | | | 31.6(M) | Pathogens | Municipal/Septic Tanks/Urban Runoff/Storm Sewers/Agriculture |
| Cat Creek | (KY5100204-017) | 7.7(M) | Organic Enrichment/ Metals | Source Unknown | | | |
| South Fork Red River | (KY5100204-018) | 10.1(M) | Chlorides | Petroleum Activities | | | |

List of Streams Not Supporting Uses by River Basin (Continued)

| Stream | (Waterbody I.D.) | Aquatic Life (miles) | Cause | Source | Swimming (miles) | Cause | Source |
|---|---|---|---|---|---|---|---|
| | | Uses Not Supported | | | | | |
| **Kentucky River Basin (Continued)** | | | | | | | |
| Sand Lick Creek | (KY5100204-018) | 5.0 (M) | Chlorides | Petroleum Activities | | | |
| Eagle Creek | (KY5100205-003) (KY5100205-005) | | | | 38.8(M) | Pathogens | Agriculture |
| Elkhorn Creek | (KY5100205-018) | | | | 17.8(M) | Pathogens | Source Unknown |
| Dry Run | (KY5100205-023) | | | | 7.5(E) | Pathogens | Agriculture/Urban Runoff/Storm Sewers |
| U.T. to North Elkhorn Creek | (KY5100205-025) | | | | 10.8(E) | Pathogens | Agriculture |
| South Elkhorn Creek | (KY5100205-026) | | | | 17.6(M) | Pathogens | Urban Runoff/ Storm Sewers/ Agriculture |
| Lee Branch | (KY5100205-027) | 1.0(E) | Organic Enrichment | Municipal | | | |
| Town Branch of S. Elkhorn Creek | (KY5100205-028) | 11.3(M) | Organic Enrichment/ Nutrients | Municipal/Urban Runoff/Storm Sewers | | | |
| Clarks Run | (KY5100205-039) | 8.0(E) | pH/Organic Enrichment | Municipal/Urban Runoff/Storm Sewers | 8.0(E) | pH | Municipal/Urban Runoff/Storm Sewers |

List of Streams Not Supporting Uses by River Basin (Continued)

| Stream (Waterbody I.D.) | | Uses Not Supported: Aquatic Life (miles) | Cause | Source | Swimming (miles) | Cause | Source |
|---|---|---|---|---|---|---|---|
| **Kentucky River Basin (Continued)** | | | | | | | |
| Kentucky River | (KY5100205-047) | | | | 32.7(M) | Pathogens | Package Plants |
| Baughman Fork | (KY5100205-054) | 1.1(M) | Organic Enrichment/ Nutrients | Package Plants | | | |
| **Green River Basin** | | | | | | | |
| Valley Creek | (KY5110001-012) | 17.5(M) | Organic Enrichment/ Chlorine | Municipal/ Urban Runoff/ Storm Sewers | | | |
| Green River | (KY5110001-018) | | | | 66.7(M) | Pathogens | Pasture Land/Feed Lots/Animal Holding/Mgt. Areas |
| Patoka Creek | (KY5110002-018) | | | | 4.3(E) | Pathogens | Pasture Land/ Feedlots/ Animal Holding/ Mgt. Areas |
| Lewis Creek | (KY5110003-002) | 14.9(E) | pH | Acid Mine Drainage | 14.9(E) | pH | Acid Mine Drainage |
| Pond Creek | (KY5110003-003) | 23.8(E) | pH/Metals | Mining | 23.8(E) | pH/Metals | Mining |
| Bat East Creek | (KY5110003-003) | 7.3(E) | pH/Metals | Acid Mine Drainage | 7.3(E) | pH | Acid Mine Drainage |
| Caney Fork | (KY5110003-003) | 7.1(E) | pH/Metals | Acid Mine Drainage | 7.1(E) | pH | Acid Mine Drainage |
| Sandlick Creek | (KY5110003-003) | 4.0(E) | pH/Metals | Acid Mine Drainage | 4.0(E) | pH | Acid Mine Drainage |

List of Streams Not Supporting Uses by River Basin (Continued)

| Stream (Waterbody I.D.) | | Uses Not Supported<br>Aquatic Life (miles) | Cause | Source | Swimming (miles) | Cause | Source |
|---|---|---|---|---|---|---|---|
| <u>Green River Basin (Continued)</u> | | | | | | | |
| Mud River | (KY5110003-005)<br>(KY5110003-008) | 64.8(M) | Priority Organics/<br>Organic<br>Enrichment | Industrial/<br>Unknown | | | |
| Green River | (KY5110005-001)<br>(KY5110005-003)<br>(KY5110005-011) | | | | 55.1(M) | Pathogens | Agriculture/<br>Urban Runoff/<br>Storm Sewers |
| North Fk. Panther Creek | (KY5110005-009) | 12.7(E) | Flow Alteration/<br>Habitat Alteration | Channelization | | | |
| South Fk. Panther Creek | (KY5110005-010) | 9.9(E) | Flow Alteration/<br>Habitat Alteration | Channelization | | | |
| Buck Creek | (KY5110005-016) | 11.0(E) | Ammonia/pH/<br>Organic<br>Enrichment | Industrial/Mining/<br>Animal Holding/<br>Mgt. Areas | 11.0(E) | pH | Mining |
| West Fk. Buck Creek | (KY5110005-016) | 3.9(E) | Ammonia/pH/<br>Organic<br>Enrichment | Industrial/Mining<br>Animal Holding/<br>Mgt. Areas | 3.9(E) | pH | Mining |
| Cypress Creek | (KY5110006-002) | 8.3(E) | pH | Mining | 8.3(E) | pH | Mining |
| Harris Branch | (KY5110006-002) | 2.6(E) | pH | Mining | 2.6(E) | pH | Mining |
| Flat Creek | (KY5110006-005) | 10.6(E) | pH | Mining | 10.6(E) | pH | Mining |
| UT to Flat Creek | (KY5110006-005) | 5.0(E) | pH | Mining | 5.0(E) | pH | Mining |

List of Streams Not Supporting Uses by River Basin (Continued)

| Stream (Waterbody I.D.) | | Uses Not Supported: Aquatic Life (miles) | Cause | Source | Swimming (miles) | Cause | Source |
|---|---|---|---|---|---|---|---|
| **Green River Basin (Continued)** | | | | | | | |
| Drakes Creek | (KY5110006-006) | 8.5(E) | pH | Mining | 21.3(E) | pH | Mining |
| **Upper Cumberland River Basin** | | | | | | | |
| Buck Creek | (KY5130101-016) | 0.2(M) | Siltation/Flow Alteration/ Habitat Alteration | Mining | | | |
| Cumberland River | (KY5130101-025) (KY5130101-032) | | | | 16.2(M) | Pathogens | Municipal/Package Plants/Septic Tanks |
| Straight Creek | (KY5130101-030) | | | | 24.4(M) | Pathogens | Septic Tanks/Unknown |
| Left Fork Straight Creek | (KY5130101-030) | 0.2(M) | Siltation/Flow Alteration/Mining/ Habitat Alteration | | 13.0(M) | Pathogens | Septic Tanks/Unknown |
| Poor Fork | (KY5130101-036) | | | | 49.7(M) | Pathogens | Municipal/Package Plants/Septic Tanks |
| Cloverlick Creek | (KY5130101-036) | | | | 8.1(M) | Pathogens | Septic Tanks |
| Looney Creek | (KY5130101-036) | | | | 8.9(M) | Pathogens | Municipal/Septic Tanks/Package Plants |
| Clover Fork | (KY5130101-037) | | | | 34.5(M) | Pathogens | Municipal/Septic Tanks/Package Plants |

List of Streams Not Supporting Uses by River Basin (Continued)

| Stream (Waterbody I.D.) | | Uses Not Supported<br>Aquatic Life (miles) | Cause | Source | Swimming (miles) | Cause | Source |
|---|---|---|---|---|---|---|---|
| **<u>Upper Cumberland River Basin (Continued)</u>** | | | | | | | |
| Catron Creek | (KY5130101-038) | | | | 8.5(M) | Pathogens | Septic Tanks/ Unknown |
| Martins Fork | (KY5130101-038) | 8.0(E) | pH | Mining | 4.4(M)<br>8.0(E) | Pathogens<br>pH | Septic Tanks<br>Mining |
| Cranks Creek | (KY5130101-038) | 15.1(M) | Siltation/pH | Mining | 15.1(M) | pH | Mining |
| Big Lily Creek | (KY5130103-011) | 2.6(M) | Chlorides/ Organic Enrichment | Municipal/Urban Runoff/Storm Sewers | | | |
| Elk Spring Creek | (KY5130103-018) | 1.5(E) | Organic Enrichment | Municipal | | | |
| Rock Creek | (KY5130104-007) | 4.0(M) | Metals/pH | Mining | 4.0(M) | pH | Mining |
| Roaring Paunch Creek | (KY5130104-008) | 15.6(M) | pH | Subsurface Mining/Surface Mining | 15.6(M) | pH | Mining |
| Bear Creek | (KY5130104-009) | 3.2(M) | pH | Subsurface Mining/Surface Mining | 3.2(M) | pH | Surface Mining/ Subsurface Mining |

## List of Streams Not Supporting Uses by River Basin (Continued)

| | | Uses Not Supported | | | | | |
|---|---|---|---|---|---|---|---|
| Stream (Waterbody I.D.) | | Aquatic Life (miles) | Cause | Source | Swimming (miles) | Cause | Source |
| **<u>Lower Cumberland River Basin</u>** | | | | | | | |
| North Fork Little River | (KY5130205-009) | | | | 14.0(E) | Pathogens | Urban Runoff/Storm Sewers/Agriculture |
| Elk Fork | (KY5130206-002) | 7.0(E) | Organic Enrichment | Municipal/ Agriculture | | | |
| **<u>Salt River Basin</u>** | | | | | | | |
| Pond Creek | (KY5140102-002) | 17.0(M) | Organic Enrichment/ Metals | Package Plants/ Urban Runoff/ Storm Sewers/ Unknown | 17.0(M) | Pathogens | Package Plants/ Septic Tanks/Urban Runoff/Storm Sewers |
| Northern Ditch Pond Creek (inc. Fern Creek) | (KY5140102-002) | 10.1(M) | Organic Enrichment/ Metals | Package Plants/ Urban Runoff/ Storm Sewers/ Septic Tanks | 10.1(M) | Pathogens | Package Plants/ Urban Runoff/Storm Sewers/Septic Tanks |
| Southern Ditch Pond Creek | (KY5140102-002) | 7.1(M) | Organic Enrichment/ Metals | Package Plants/ Urban Runoff/ Storm Sewers/ Septic Tanks | 7.1(M) | Pathogens | Package Plants/ Urban Runoff/ Storm Sewers/ Septic Tanks |

List of Streams Not Supporting Uses by River Basin (Continued)

| Stream (Waterbody I.D.) | | Uses Not Supported<br>Aquatic Life (miles) | Cause | Source | Swimming (miles) | Cause | Source |
|---|---|---|---|---|---|---|---|
| **Salt River Basin (Continued)** | | | | | | | |
| Spring Ditch<br>Pond Creek | (KY5140102-002) | 2.0(M) | Organic Enrichment/ Metals | Package Plants/ Urban Runoff/ Storm Sewers | 2.0(M) | Pathogens | Package Plants/ Urban Runoff/ Storm Sewers |
| Fishpool Creek | (KY5140102-002) | 5.4(M) | Organic Enrichment/ Metals | Package Plants/ Urban Runoff/ Storm Sewers/ Septic Tanks | 5.4(M) | Pathogens | Package Plants/ Urban Runoff/ Storm Sewers/ Septic Tanks |
| Knob Creek | (KY5140102-002) | 15.3(E) | Organic Enrichment/ Metals | Urban Runoff/ Storm Sewers/ Package Plants/ Septic Tanks | | | |
| Briar Creek | (KY5140102-002) | 5.7(E) | Organic Enrichment/ Metals | Urban Runoff/ Storm Sewers/ Package Plants/ Septic Tanks | | | |
| Mill Creek | (KY5140102-003) | | | | 13.5(E) | Pathogens | Municipal |

List of Streams Not Supporting Uses by River Basin (Continued)

| Stream (Waterbody I.D.) | | Uses Not Supported<br>Aquatic Life (miles) | Cause | Source | Swimming (miles) | Cause | Source |
|---|---|---|---|---|---|---|---|
| **Salt River Basin (Continued)** | | | | | | | |
| Salt River | (KY5140102-005)<br>(KY5140102-031)<br>(KY5140102-033) | | | | 47.0(M) | Pathogens | Agriculture/<br>Septic Tanks/<br>Urban Runoff/<br>Storm Sewers/<br>Package Plants |
| Floyds Fork | (KY5140102-007)<br>(KY5140102-011)<br>(KY5140102-014) | 13.0(E) | Organic<br>Enrichment<br>Metals | Package Plants/<br>Urban Runoff/<br>Storm Sewers/<br>Septic Tanks | 23.8(M)<br>13.8(E) | Pathogens | Package Plants/<br>Urban Runoff/<br>Storm Sewers/<br>Septic Tanks/<br>Agriculture |
| Pennsylvania Run | (KY5140102-008) | | | | 3.0(M) | Pathogens | Package Plants/<br>Urban Runoff/<br>Storm Sewers/<br>Septic Tanks |
| Brooks Run | (KY5140102-009) | 6.0(E) | Organic<br>Enrichment | Package Plants/<br>Urban Runoff/<br>Storm Sewers | 6.0(E) | Pathogens | Package Plants/<br>Urban Runoff/<br>Storm Sewers |
| Chenoweth Run | (KY5140102-010) | 9.1(M) | Organic<br>Enrichment/<br>Metals/<br>Nutrients | Domestic/<br>Urban Runoff/<br>Storm Sewers/ | 9.1(M) | Pathogens | Urban Runoff/<br>Storm Sewers/<br>Package Plants/ |

## List of Streams Not Supporting Uses by River Basin (Continued)

| Stream (Waterbody I.D.) | | Aquatic Life (miles) | Cause | Source | Swimming (miles) | Cause | Source |
|---|---|---|---|---|---|---|---|
| | | Uses Not Supported | | | | | |
| **Salt River Basin (Continued)** | | | | | | | |
| Pope Lick Creek | (KY5140102-012) | 5.0(M) | Organic Enrichment/ Unknown Toxicity | Package Plants/ Urban Runoff/ Storm Sewers/ Septic Tanks | 5.0(M) | Pathogens | Package Plants/ Urban Runoff/ Storm Sewers/ Septic Tanks |
| Long Run | (KY5140102-012) | | | | 9.5(M) | Pathogens | Agriculture/ Septic Tanks |
| Beech Creek | (KY5140102-026) | | | | 30.1(M) | Pathogens | Pasture Lands/ Feedlots/ Manure Lagoons/ Animal Holding/ Mgt. Areas/ Septic Tanks |
| Crooked Creek | (KY5140102-027) | | | | 13.9(M) | Pathogens | Unknown |
| Ashes Creek | (KY5140102-028) | | | | 10.3(M) | Pathogens | Pasture Land/ Feedlots/ Animal Holding/ Mgt. Areas |

List of Streams Not Supporting Uses by River Basin (Continued)

| Stream (Waterbody I.D.) | | Uses Not Supported Aquatic Life (miles) | Cause | Source | Swimming (miles) | Cause | Source |
|---|---|---|---|---|---|---|---|
| **Salt River Basin (Continued)** | | | | | | | |
| Jacks Creek | (KY5140102-028) | | | | 8.0(M) | Pathogens | Pasture Land/ Feedlots/ Manure Lagoons/ Animals Holding/ Mgt. Areas |
| Timber Creek | (KY5140102-028) | | | | 4.8(M) | Pathogens | Pasture Land/ Feedlots/ Manure Lagoons/ Animals Holding/ Mgt. Areas |
| Town Creek | (KY5140102-033) | | | | 3.2(M) | Pathogens | Pasture Lands/ Feedlots/Animal Holding/Mgt. Areas |
| Rolling Fork | (KY5140103-001) (KY5140103-005) | | | | 108.0(M) | Pathogens | Municipal/ Agriculture/Urban Runoff/Storm/ Sewers |
| Beech Fork | (KY5140103-012) | | | | 10.2(M) | Pathogens | Agriculture |

List of Streams Not Supporting Uses by River Basin (Continued)

| Stream (Waterbody I.D.) | | Uses Not Supported<br>Aquatic Life (miles) | Cause | Source | Swimming (miles) | Cause | Source |
|---|---|---|---|---|---|---|---|
| **<u>Tradewater River Basin</u>** | | | | | | | |
| Crab Orchard Creek | (KY5140205-003) | 22.6(E) | pH/Siltation | Mining/ Agriculture | 22.6(E) | pH | Mining |
| Vaughn Ditch | (KY5140205-003) | 3.2(E) | pH/Siltation | Mining/ Agriculture | 3.2(E) | pH | Mining |
| Clear Creek | (KY5140205-008) | 28.1(E) | pH/Siltation | Mining/ Agriculture | 28.1(E) | pH | Mining |
| Lick Creek | (KY5140205-008) | 18.1(E) | pH/Siltation | Mining/ Agriculture | 18.1(E) | pH | Mining |
| Caney Creek | (KY5140205-015) | 11.3(E) | pH/Siltation | Mining/ Agriculture | 11.3(E) | pH | Mining |
| Buffalo Creek | (KY5140205-016) | 7.8(E) | pH/Siltation | Mining/ Agriculture | 7.8(E) | pH | Mining |
| **<u>Tennessee River Basin</u>** | | | | | | | |
| Cypress Creek | (KY6040006-013) | 19.4(E) | Unknown Toxicity/ Priority Organics | Industrial | | | |
| **<u>Ohio River Tributaries</u>** | | | | | | | |
| Elijah's Creek | (KY5090203-004) | 5.2(M) | Nonpriority Organics | Industrial | | | |
| Big Run | (KY5140101-001) | 5.3(E) | Organic Enrichment | Urban Runoff/ Storm Sewers | | | |

List of Streams Not Supporting Uses by River Basin (Continued)

| Stream (Waterbody I.D.) | | Uses Not Supported<br>Aquatic Life (miles) | Cause | Source | Swimming (miles) | Cause | Source |
|---|---|---|---|---|---|---|---|
| **Ohio River Tributaries (Continued)** | | | | | | | |
| UT to Mill Creek | (KY5140101-001) | 2.5(E) | Organic Enrichment | Urban Runoff/ Storm Sewers | | | |
| Mill Creek | (KY5140101-001) | 16.5(M) | Metals | Urban Runoff/ Storm Sewers/ Septic Tanks | 16.5(M) | Pathogens | Urban Runoff/ Package Plants/ Storm Sewers/ Septic Tanks |
| Beargrass Creek | (KY5140101-002) | 1.6(E) | Organic Enrichment/Metals | Urban Runoff/ Storm Sewers/ Combined Sewer Overflows/ Package Plants/ Septic Tanks | | | |
| Muddy Fork Beargrass Creek | (KY5140101-002) | 6.9(M) | Organic Enrichment/Metals | Urban Runoff/ Storm Sewers/ Package Plants/ Septic Tanks | | | |
| South Fork Beargrass Creek | (KY5140101-002) | 14.6(M) | Organic Enrichment/Metals | Urban Runoff/ Storm Sewers/ Combined Sewer Overflows | 6.0(M) | Pathogens | Combined Sewer Overflows/Urban Runoff/Storm Sewers |

**List of Streams Not Supporting Uses by River Basin (Continued)**

| Stream (Waterbody I.D.) | | Aquatic Life (miles) | Cause | Source | Swimming (miles) | Cause | Source |
|---|---|---|---|---|---|---|---|
| | | Uses Not Supported | | | | | |
| <u>Ohio River Tributaries (Continued)</u> | | | | | | | |
| Middle Fork Beargrass Creek | (KY5140101-002) | 15.2(M) | Organic Enrichment/Metals | Urban Runoff/ Storm Sewers/ Package Plants/ Septic Tanks/ Combined Sewer Overflows | 15.2(M) | Pathogens | Package Plants Septic Tanks/ Urban Runoff/ Storm Sewers/ Combined Sewer Overflows |
| Goose Creek | (KY5140101-003) | 4.5(M) | Organic Enrichment/Metals | Package Plants/ Urban Runoff/ Storm Sewers/ Septic Tanks | 7.2(M) | Pathogens | Package Plants/ Urban Runoff/ Storm Sewers/ Septic Tanks |
| Little Goose Creek | (KY5140101-003) | | | | 8.7(M) | Pathogens | Package Plants/ Urban Runoff/ Storm Sewers/ Septic Tanks |
| Harrods Creek | (KY5140101-004) | 4.0(M) | Organic Enrichment/Metals | Package Plants/ Urban Runoff/ Storm Sewers Septic Tanks | 4.0(M) | Pathogens | Package Plants/ Urban Runoff/ Storm Sewers/ Septic Tanks |
| Little Bayou Creek | (KY5140206-002) | 6.5(M) | Priority Organics | Hazardous Waste | | | |

*E = evaluated
**M = monitored

# APPENDIX D
# USE SUPPORT IN OHIO RIVER WATERBODIES

## Ohio River - Warm Water Aquatic Life Use Support Assessment

| Waterbody ID | States | From - To River Miles | Total Miles | Fully Supporting | Partially Supporting | Not Supporting | Causes | Potential Sources |
|---|---|---|---|---|---|---|---|---|
| OVWB 01 | PA | 0.0 - 6.2 | 6.2 | | 6.2 | | Cu, Mlwb | Mining, Ind Point, Mun Point, Urban Runoff |
| OVWB 02 | PA | 6.2 - 13.3 | 7.1 | | 7.1 | | Cu, Mlwb | Mining, Ind Point, Mun Point, Urban Runoff |
| OVWB 03 | PA | 13.3 - 25.4 | 12.1 | | 12.1 | | Cu, Mlwb | Mining, Ind Point, Mun Point, Urban Runoff |
| OVWB 04 | PA | 25.4 - 31.7 | 6.3 | | 6.3 | | Cu | Mining, Ind Point, Mun Point, Urban Runoff |
| OVWB 05 | PA | 31.7 - 40.2 | 8.5 | | 8.5 | | Cu | Mining, Ind Point, Mun Point, Urban Runoff |
| OVWB 06 | OH - WV | 40.2 - 54.4 | 14.2 | 14.2 | | | | |
| OVWB 07 | OH - WV | 54.4 - 84.2 | 29.8 | 29.8 | | | | |
| OVWB 08 | OH - WV | 84.2 - 126.4 | 42.2 | 42.2 | | | | |
| OVWB 09 | OH - WV | 126.4 - 161.7 | 35.3 | | 35.3 | | Cu | Mining, Ind Point, Mun Point, Urban Runoff |
| OVWB 10 | OH - WV | 161.7 - 172.2 | 10.5 | | 10.5 | | Cu | Mining, Ind Point, Mun Point, Urban Runoff |
| OVWB 11 | OH - WV | 172.2 - 203.9 | 31.7 | 31.7 | | | | |
| OVWB 12 | OH - WV | 203.9 - 237.5 | 33.6 | 33.6 | | | | |
| OVWB 13 | OH - WV | 237.5 - 265.7 | 28.2 | 28.2 | | | | |
| OVWB 14 | OH - WV | 265.7 - 279.2 | 13.5 | | 13.5 | | Pb, Cu, Mlwb | Ind Point, Mun Point, Urban Runoff |
| OVWB 15 | OH - WV | 279.2 - 317.1 | 37.9 | | 37.9 | | Pb, Cu, Mlwb | Ind Point, Mun Point, Urban Runoff |
| OVWB 16 | KY - OH | 317.1 - 341.0 | 23.9 | | 23.9 | | Pb, Mlwb | Ind Point, Mun Point, Urban Runoff |
| OVWB 17 | KY - OH | 341.0 - 356.5 | 15.5 | | 15.5 | | Pb | Ind Point, Mun Point, Urban Runoff |
| OVWB 18 | KY - OH | 356.5 - 436.2 | 79.7 | 79.7 | | | | |
| OVWB 19 | KY - OH | 436.2 - 464.1 | 27.9 | 27.9 | | | | |
| OVWB 20 | KY - OH | 464.1 - 470.2 | 6.1 | 6.1 | | | | |
| OVWB 21 | KY - OH | 470.2 - 491.1 | 20.9 | | 20.9 | | Zn, Mlwb | Unknown Nonpoint Source |
| OVWB 22 | KY - IN | 491.1 - 531.5 | 40.4 | | 40.4 | | Zn | Unknown Nonpoint Source |
| OVWB 23 | KY - IN | 531.5 - 545.8 | 14.3 | 14.3 | | | | |
| OVWB 24 | KY - IN | 545.8 - 606.8 | 61.0 | | 61.0 | | Zn | Unknown Nonpoint Source |
| OVWB 25 | KY - IN | 606.8 - 629.9 | 23.1 | 23.1 | | | | |
| OVWB 26 | KY - IN | 629.9 - 720.7 | 90.8 | | 90.8 | | Cu | Unknown Nonpoint Source |
| OVWB 27 | KY - IN | 720.7 - 776.1 | 55.4 | | 55.4 | | Cu | Unknown Nonpoint Source |
| OVWB 28 | KY - IN | 776.1 - 784.2 | 8.1 | | 8.1 | | Cu | Unknown Nonpoint Source |
| OVWB 29 | KY - IN | 784.2 - 846.0 | 61.8 | | 61.8 | | Cu | Unknown Nonpoint Source |
| OVWB 30 | KY - IN | 846.0 - 848.0 | 2.0 | | 2.0 | | Cu | Unknown Nonpoint Source |
| OVWB 31 | KY - IL | 848.0 - 918.5 | 70.5 | | 70.5 | | Cu, Pb, Zn | Unknown Nonpoint Source |
| OVWB 32 | KY - IL | 918.5 - 920.4 | 1.9 | | 1.9 | | Pb, Zn | Unknown |
| OVWB 33 | KY - IL | 920.4 - 934.5 | 14.1 | | 14.1 | | Pb | Unknown |
| OVWB 34 | KY - IL | 934.5 - 981.0 | 46.5 | 46.5 | | | | |

Ind Point - industrial point source  Mun Point - municipal point source

Source: Table 10, ORSANCO, 1994

# Ohio River -Contact Recreational Use Support Assessment Summary

| Waterbody ID | States | From - To River Miles | Total Miles | Fully Supporting | Partially Supporting | Not Supporting | Causes | Potential Sources |
|---|---|---|---|---|---|---|---|---|
| OVWB 01 | PA | 0.0 - 6.2 | 6.2 | | | 6.2 | Pathogen | CSO, Urban Runoff |
| OVWB 02 | PA | 6.2 - 13.3 | 7.1 | | | 7.1 | Pathogen | CSO, Urban Runoff |
| OVWB 03 | PA | 13.3 - 25.4 | 12.1 | | | 12.1 | Pathogen | CSO, Urban Runoff |
| OVWB 04 | PA | 25.4 - 31.7 | 6.3 | | 6.3 | | Pathogen | CSO, Urban Runoff |
| OVWB 05 | PA | 31.7 - 40.2 | 8.5 | | 8.5 | | Pathogen | CSO, Urban Runoff |
| OVWB 06 | OH - WV | 40.2 - 54.4 | 14.2 | | 14.2 | | Pathogen | CSO, Urban Runoff |
| OVWB 07 | OH - WV | 54.4 - 84.2 | 29.8 | | 29.8 | | Pathogen | CSO, Urban Runoff |
| OVWB 08 | OH - WV | 84.2 - 126.4 | 42.2 | | 42.2 | | Pathogen | CSO, Urban Runoff |
| OVWB 09 | OH - WV | 126.4 - 161.7 | 35.3 | | 35.3 | | Pathogen | CSO, Urban Runoff |
| OVWB 10 | OH - WV | 161.7 - 172.2 | 10.5 | | 10.5 | | Pathogen | CSO, Urban Runoff |
| OVWB 11 | OH - WV | 172.2 - 203.9 | 31.7 | | 31.7 | | Pathogen | CSO, Urban Runoff |
| OVWB 12 | OH - WV | 203.9 - 237.5 | 33.6 | | 33.6 | | Pathogen | CSO, Urban Runoff |
| OVWB 13 | OH - WV | 237.5 - 265.7 | 28.2 | | 28.2 | | Pathogen | CSO, Urban Runoff |
| OVWB 14 | OH - WV | 265.7 - 279.2 | 13.5 | | 13.5 | | Pathogen | CSO, Urban Runoff |
| OVWB 15 | OH - WV | 279.2 - 317.1 | 37.9 | | 32.7 | 5.2 | Pathogen | CSO, Urban Runoff |
| OVWB 16 | KY - OH | 317.1 - 341.0 | 23.9 | | | 23.9 | Pathogen | CSO, Urban Runoff |
| OVWB 17 | KY - OH | 341.0 - 356.5 | 15.5 | | 15.5 | | Pathogen | CSO, Urban Runoff |
| OVWB 18 | KY - OH | 356.5 - 436.2 | 79.7 | | 79.7 | | Pathogen | CSO, Urban Runoff |
| OVWB 19 | KY - OH | 436.2 - 464.1 | 27.9 | | 27.9 | | Pathogen | CSO, Urban Runoff |
| OVWB 20 | KY - OH | 464.1 - 470.2 | 6.1 | | | 6.1 | Pathogen | CSO, Urban Runoff |
| OVWB 21 | KY - OH | 470.2 - 491.1 | 20.9 | | | 20.9 | Pathogen | CSO, Urban Runoff |
| OVWB 22 | KY - IN | 491.1 - 531.5 | 40.4 | | 40.4 | | Pathogen | CSO, Urban Runoff |
| OVWB 23 | KY - IN | 531.5 - 545.8 | 14.3 | | 14.3 | | Pathogen | CSO, Urban Runoff |
| OVWB 24 | KY - IN | 545.8 - 606.8 | 61.0 | | 61.0 | | Pathogen | CSO, Urban Runoff |
| OVWB 25 | KY - IN | 606.8 - 629.9 | 23.1 | | | 23.1 | Pathogen | CSO, Urban Runoff |
| OVWB 26 | KY - IN | 629.9 - 720.7 | 90.8 | | 90.8 | | Pathogen | CSO, Urban Runoff |
| OVWB 27 | KY - IN | 720.7 - 776.1 | 55.4 | | 55.4 | | Pathogen | CSO, Urban Runoff |
| OVWB 28 | KY - IN | 776.1 - 784.2 | 8.1 | | | 8.1 | Pathogen | CSO, Urban Runoff |
| OVWB 29 | KY - IN | 784.2 - 846.0 | 61.8 | | 46.0 | 15.8 | Pathogen | CSO, Urban Runoff |
| OVWB 30 | KY - IN | 846.0 - 848.0 | 2.0 | | 2.0 | | Pathogen | CSO, Urban Runoff |
| OVWB 31 | KY - IL | 848.0 - 918.5 | 70.5 | | 70.5 | | Pathogen | CSO, Urban Runoff |
| OVWB 32 | KY - IL | 918.5 - 920.4 | 1.9 | | 1.9 | | Pathogen | CSO, Urban Runoff |
| OVWB 33 | KY - IL | 920.4 - 934.5 | 14.1 | | | 14.1 | Pathogen | CSO, Urban Runoff |
| OVWB 34 | KY - IL | 934.5 - 981.0 | 46.5 | | 31.0 | 15.5 | Pathogen | CSO, Urban Runoff |

Source: Table 12, ORSANCO, 1994

## Ohio River - Public Water Supply Use Support Assessment Summary

| Waterbody ID | States | From - To River Miles | Total Miles | Fully Supporting | Partially Supporting | Not Supporting | Causes | Potential Sources |
|---|---|---|---|---|---|---|---|---|
| OVWB 01 | PA | 0.0 - 6.2 | 6.2 | 6.2 | | | | |
| OVWB 02 | PA | 6.2 - 13.3 | 7.1 | 7.1 | | | | |
| OVWB 03 | PA | 13.3 - 25.4 | 12.1 | 12.1 | | | | |
| OVWB 04 | PA | 25.4 - 31.7 | 6.3 | 6.3 | | | | |
| OVWB 05 | PA | 31.7 - 40.2 | 8.5 | 8.5 | | | | |
| OVWB 06 | OH - WV | 40.2 - 54.4 | 14.2 | 14.2 | | | | |
| OVWB 07 | OH - WV | 54.4 - 84.2 | 29.8 | 29.8 | | | | |
| OVWB 08 | OH - WV | 84.2 - 126.4 | 42.2 | 42.2 | | | | |
| OVWB 09 | OH - WV | 126.4 - 161.7 | 35.3 | 35.3 | | | | |
| OVWB 10 | OH - WV | 161.7 - 172.2 | 10.5 | 10.5 | | | | |
| OVWB 11 | OH - WV | 172.2 - 203.9 | 31.7 | 31.7 | | | | |
| OVWB 12 | OH - WV | 203.9 - 237.5 | 33.6 | 33.6 | | | | |
| OVWB 13 | OH - WV | 237.5 - 265.7 | 28.2 | 28.2 | | | | |
| OVWB 14 | OH - WV | 265.7 - 279.2 | 13.5 | 13.5 | | | | |
| OVWB 15 | OH - WV | 279.2 - 317.1 | 37.9 | 37.9 | | | | |
| OVWB 16 | KY - OH | 317.1 - 341.0 | 23.9 | 23.9 | | | | |
| OVWB 17 | KY - OH | 341.0 - 356.5 | 15.5 | 15.5 | | | | |
| OVWB 18 | KY - OH | 356.5 - 436.2 | 79.7 | 79.7 | | | | |
| OVWB 19 | KY - OH | 436.2 - 464.1 | 27.9 | 27.9 | | | | |
| OVWB 20 | KY - OH | 464.1 - 470.2 | 6.1 | 6.1 | | | | |
| OVWB 21 | KY - OH | 470.2 - 491.1 | 20.9 | 20.9 | | | | |
| OVWB 22 | KY - IN | 491.1 - 531.5 | 40.4 | 40.4 | | | | |
| OVWB 23 | KY - IN | 531.5 - 545.8 | 14.3 | | 14.3 | | Pesticides | Agricultural Runoff |
| OVWB 24 | KY - IN | 545.8 - 606.8 | 61.0 | | 61.0 | | Pesticides | Agricultural Runoff |
| OVWB 25 | KY - IN | 606.8 - 629.9 | 23.1 | | 23.1 | | Pesticides | Agricultural Runoff |
| OVWB 26 | KY - IN | 629.9 - 720.7 | 90.8 | | 90.8 | | Pesticides | Agricultural Runoff |
| OVWB 27 | KY - IN | 720.7 - 776.1 | 55.4 | | 55.4 | | Pesticides | Agricultural Runoff |
| OVWB 28 | KY - IN | 776.1 - 784.2 | 8.1 | | 8.1 | | Pesticides | Agricultural Runoff |
| OVWB 29 | KY - IN | 784.2 - 846.0 | 61.8 | | 61.8 | | Pesticides | Agricultural Runoff |
| OVWB 30 | KY - IN | 846.0 - 848.0 | 2.0 | | 2.0 | | Pesticides | Agricultural Runoff |
| OVWB 31 | KY - IL | 848.0 - 918.5 | 70.5 | | 70.5 | | Pesticides | Agricultural Runoff |
| OVWB 32 | KY - IL | 918.5 - 920.4 | 1.9 | | 1.9 | | Pesticides | Agricultural Runoff |
| OVWB 33 | KY - IL | 920.4 - 934.5 | 14.1 | | 14.1 | | Pesticides | Agricultural Runoff |
| OVWB 34 | KY - IL | 934.5 - 981.0 | 46.5 | | 46.5 | | Pest/Pri Organic | Ag/Groundwater Load |

Source: Table 14, ORSANCO, 1994

# Ohio River - 1992 ORSANCO FISH TISSUE CONTAMINANTS PROGRAM
## PCB/CHLORDANE EXCEEDANCES

| LOCATION | RIVER MILE | SPECIES | SIZE RANGE (INCHES) | PCB | CHLORDANE |
|---|---|---|---|---|---|
| Mon #2 L&D* | RM 12.3 | Carp | 16.5 - 19.0 | ■ | ■ |
| Mon #2 L&D | RM 12.3 | Carp | 15.0 - 21.0 | ■ | ■ |
| Mon #2 L&D | RM 12.3 | Channel Cat | 15.5 - 19.0 | ■ | |
| Mon #2 L&D | RM 12.3 | SM Bass | 13.0 - 15.0 | | |
| Emsworth L&D | RM 6.2 | Carp | 19.5 - 22.0 | ■ | ■ |
| Emsworth L&D | RM 6.2 | Channel Cat | 18.5 - 20.5 | ■ | ■ |
| Emsworth L&D | RM 6.2 | Channel Cat | 18.5 - 20.5 | ■ | ■ |
| Emsworth L&D | RM 6.2 | Channel Cat | 15.5 - 17.0 | | |
| Emsworth L&D | RM 6.2 | Sauger | 14.5 - 17.5 | | |
| Hayesville, PA | RM 10.7 | Channel Cat | 15.0 - 19.5 | ■ | ■ |
| Hayesville, PA | RM 10.7 | Carp | 14.0 - 17.5 | ■ | |
| Montgomery L&D | RM 31.7 | Carp | 19.0 - 20.0 | ■ | |
| Montgomery L&D | RM 31.7 | Channel Cat | 19.5 - 21.5 | ■ | ■ |
| Montgomery L&D | RM 31.7 | Channel Cat | 17.5 - 19.0 | ■ | ■ |
| Montgomery L&D | RM 31.7 | Channel Cat | 16.0 - 17.5 | ■ | |
| Chester, WV | RM 44.1 | Carp | 15.5 - 21.5 | | |
| Chester, WV | RM 44.1 | SM Bass | 13.0 - 15.0 | | |
| Chester, WV | RM 44.1 | Sauger | 13.0 - 17.0 | | |
| Pike Is. L&D | RM 84.2 | Carp | 19.0 - 21.0 | ■ | ■ |
| Pike Is. L&D | RM 84.2 | Channel Cat | 12.5 - 15.5 | | |
| Pike Is. L&D | RM 84.2 | Channel Cat | 16.5 - 18.5 | ■ | ■ |
| Pike Is. L&D | RM 84.2 | Channel Cat | 21.5 - 24.5 | ■ | ■ |
| Pike Is. L&D | RM 84.2 | Hybrid Striper | 13.0 - 18.0 | | |
| Pike Is. L&D | RM 84.2 | SM Bass | 15.0 - 16.0 | | |
| Hannibal L&D | RM 126.4 | Flathead Cat | 27.0 - 30.5 | ■ | ■ |
| Hannibal L&D | RM 126.4 | Flathead Cat | 19.5 - 20.5 | | |
| Willow Is. L&D | RM 161.7 | Carp | 19.5 - 23.0 | ■ | ■ |
| Willow Is. L&D | RM 161.7 | Channel Cat | 15.5 - 16.5 | ■ | ■ |
| Willow Is. L&D | RM 161.7 | Channel Cat | 20.0 - 21.5 | ■ | ■ |
| Willow Is. L&D | RM 161.7 | Channel Cat | 23.5 - 25.0 | ■ | |
| Willow Is. L&D | RM 161.7 | Hybrid Striper | 18.0 - 25.0 | | |
| Belpre, OH | RM 182.7 | Channel Cat | 20.0 - 21.0 | ■ | ■ |
| Belpre, OH | RM 182.7 | Channel Cat | 18.0 - 21.5 | ■ | |
| Belpre, OH | RM 182.7 | Carp | 17.5 - 21.5 | ■ | ■ |

| LOCATION | RIVER MILE | SPECIES | SIZE RANGE (INCHES) | PCB | CHLORDANE |
|---|---|---|---|---|---|
| Belleville L&D | RM 203.9 | Flathead Cat | 19.5 - 22.5 | □ | □ |
| Racine L&D | RM 237.5 | Carp | 19.5 - 22.0 | ■ | □ |
| Racine L&D | RM 237.5 | Channel Cat | 15.5 - 19.5 | ■ | □ |
| Racine L&D | RM 237.5 | Channel Cat | 15.5 - 19.5 | ■ | ■ |
| Racine L&D | RM 237.5 | Channel Cat | 21.5 - 23.5 | ■ | ■ |
| Racine L&D | RM 237.5 | Flathead Cat | 28.0 - 36.0 | ■ | ■ |
| Racine L&D | RM 237.5 | Hybrid Striper | 17.5 - 20.0 | □ | □ |
| Cheshire, OH | RM 255.9 | Carp | 19.5 - 23.0 | □ | □ |
| Gallipolis L&D | RM 279.2 | Hybrid Striper | 18.0 - 22.5 | □ | □ |
| Greenup L&D | RM 341.0 | Carp | 22.0 - 23.5 | □ | □ |
| Greenup L&D | RM 341.0 | Channel Cat | 17.5 - 18.5 | □ | □ |
| Greenup L&D | RM 341.0 | Channel Cat | 22.0 - 27.0 | ■ | ■ |
| Greenup L&D | RM 341.0 | Channel Cat | 24.0 - 27.0 | ■ | ■ |
| Greenup L&D | RM 341.0 | Channel Cat | 17.0 - 18.0 | | |
| Markland L&D | RM 531.5 | Carp | 22.0 - 24.5 | □ | □ |
| Markland L&D | RM 531.5 | Channel Cat | 14.0 - 17.5 | □ | ■ |
| Markland L&D | RM 531.5 | Channel Cat | 20.0 - 21.5 | ■ | ■ |
| Markland L&D | RM 531.5 | Channel Cat | 21.5 - 23.0 | ■ | ■ |
| Bethlehem, IN | RM 569.7 | Channel Cat | 20.5 - 23.5 | □ | ■ |
| Cannelton L&D | RM 720.7 | Carp | 22.0 - 23.0 | □ | □ |
| Cannelton L&D | RM 720.7 | Channel Cat | 17.0 - 18.5 | | |
| Cannelton L&D | RM 720.7 | Channel Cat | 19.5 - 21.5 | ■ | ■ |
| Cannelton L&D | RM 720.7 | Channel Cat | 22.5 - 25.0 | | |
| Cannelton L&D | RM 720.7 | Striped Bass | 12.0 - 14.0 | | |
| Rockport, IN | RM 746.9 | Channel Cat | 17.0 - 19.5 | | |
| Rockport, IN | RM 746.9 | Spotted Bass | 11.5 - 15.5 | | |
| Uniontown L&D | RM 846.0 | Carp | 21.5-23.5 | | |
| Uniontown L&D | RM 846.0 | Channel Cat | 17.5 - 19.5 | | |
| Uniontown L&D | RM 846.0 | Channel Cat | 21.5 - 22.0 | | |
| Uniontown L&D | RM 846.0 | Channel Cat | 22.5 - 23.5 | | ■ |
| Uniontown L&D | RM 846.0 | Striped Bass | 14.0 - 14.5 | | □ |
| Uniontown L&D | RM 846.0 | Channel Cat | 14.5 - 19.0 | | |
| Uniontown L&D | RM 846.0 | Sauger | 12.5 - 14.5 | | |
| Uniontown L&D | RM 846.0 | Channel Cat | 15.5 - 19.5 | | |
| Cave-In-Rock, IL | RM 882.0 | Carp | 19.5 - 23.0 | | |
| Cave-In-Rock, IL | RM 882.0 | LM Bass | 14.0 - 15.5 | | |
| Cave-In-Rock, IL | RM 882.0 | Channel Cat | 14.5 - 22.0 | | |

L&D = Locks and Dam Location

□ = Does not exceed action level

■ = Does exceed action level

Source: Table 15, ORSANCO, 1994

# APPENDIX E
# SECTION 319-FUNDED NONPOINT SOURCE PROJECTS IN WATERSHEDS WITH ONGOING TMDL STUDIES

## Section 319-Funded Nonpoint Source Projects in Kentucky

| Project | Outputs | Project Cost/Schedule |
|---|---|---|
| Upper Salt River/Taylorsville Reservoir Project | Collect water quality data. Initiate Water Watch sampling. Total Maximum Daily Load (TMDL) implementation. Provide additional technical assistance to landowners. Assist with water quality monitoring. Hire project coordinator. Develop and print newsletter. Establish BMP tracking system. | \$607,541 FFY91-FFY98 |
| Upper North Fork of the Kentucky River On-Site Wastewater Management Project | On-site wastewater disposal alternatives. Public education program. Pre- and post-BMP monitoring. BMP implementation. | \$330,000 FFY94-FFY96 |
| Floyd's Fork Community Education Project--Louisville/Jefferson County Conservation District | Develop three video tape presentations for development community, residents of Floyd's Fork, and high school students. | \$83,334 FFY92-FFY93 |
| Harrods Creek Community Education Project-Jefferson County Conservation District | Brochure for small site homebuilders and developers. Brochure: "Homeowners Conservation and Watershed Management Guide." Brochure: "You and the Waters of Harrods Creek." Curriculum Guide. Field Demonstration. | \$86,000 FFY94-FFY95 |